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control cigarette to test the ability of the heat set filter to resist menthol absorption.

PVA menthol models of Marlboro Lights Menthol have been made in the semiworks and are being subjectively evaluated.

A model of Philip Morris Lights with PVA menthol has also been made in the Semiworks and will be evaluated. This is being done in an effort to combine a charcoal filter with menthol delivery.

V. TOW VENDOR R&D COORDINATION

A. Objective: Coordinate specific requests for R&D work by Eastman and Celanese.

B. Status: At our request, Eastman has produced and submitted sample rods made from low denier tow (1.6/41000). An initial evaluation shows that an increased efficiency was achieved (73% vs 64% for MUL at same RTD). This may allow the construction of ultra low delivery cigarettes with reduced ventilation. A more comprehensive test is being planned that will include subjective evaluation.

VI. FILTER ADDITIVES

A. Objective: Investigate the effects of filter additives for analytical and subjective benefits.

B. Status: Initial testing of FML filters with hand applied additives has identified potential candidates for modification of subjectives. Machine made plugs with consistently applied additives will now be made and subjectively evaluated.

Samples of GCC Marlboro cigarettes with filter additives are being made in the semiworks and will be evaluated for nicotine delivery, tar delivery and subjectives.

C. Plans: Produce FML filters with additives and evaluate.

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PROJECT NUMBER: 2304
PROJECT TITLE: Flavor Development - New Products
PROJECT LEADER: Barbara G. Taylor
PERIOD COVERED: September, 1988

I. STUDIO/TRIM

A. Objective: To develop subjectively acceptable cigarettes withreduced sidestream visibility along the lines of a Virginia Slims at 20 and 23mm circumferences.

B. Status: Cigarette models with various low-sidestream papers (Control - KC156, 10-037A, 2121-83 (a new $CaCO_3$ paper), and a $Mg(OH)_2$ paper) were made with Va. Slim and Trim IV blends. Subjective evaluations are underway. The following aftercuts are being evaluated on the two blends at 20 and 23mm circumferences:

8682-16B	Super Juice III and Marlboro system
8682-16D	A Bright Flavor with honey character
8544-49	The Trim flavor system

II. LOW DENSITY ROD

A. Objective: To achieve reduced tobacco weights in PM products via the Low Density process.

B. Status: The cigarette models for the Aftercut Study have been completed. Subjective evaluations have been initiated. The casing study models, which consisted of four casings, have been subjectively evaluated. Results indicated that 8493-188A casing is the best casing of those tested for the Low Density models.

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B. Results: A Danchi is ready to be shipped this month which will evaluate blend, tar level, and menthol level.

C. Plans: A second Danchi is to be sent later this month which will be further variations of tar and menthol on the blends used in the previous Danchi.

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Twenty-four hour trial runs of chocolate, licorice, and total casing were made. Analysis is in progress.

C. Plans:

Complete trial runs to further define scope and duration of study.

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C. Plans:

Cigarette Remake (MGC)	To be scheduled

IV. ALTERNATE HUMECTANT PROGRAM:

A. Objective: To develop the capability to produce cigarettes that are glycerin free and cigarettes that are propylene glycol and glycerin free, while maintaining product subjective integrity.

B. Status: G-free POL cigarettes will be remade, again. This will be delayed due to the necessity to remake sheet and stem materials. Models for the PG/G-free program were evaluated, and found to be acceptable. Further evaluation to confirm this is in progress.

C. Plans:

G-free POL Remake	December, 1988
Semiworks PG/G-free Cigarette Evaluation	September 1988

V. PROJECT GRAIN:

A. Objective: To significantly reduce alcohol levels in PM flavor systems, while maintaining product subjective integrity.

B. Status: POL testing is on hold. Aftercuts were prepared at Twentieth Street to investigate low anethol values observed previously.

C. Plans:

Cigarette Production for Internal Testing	To Be Scheduled
Resolution of low Anethole	October, 1988

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VI. CASING STUDY:

A. Objective: To determine the affect of prolonged heating on burley spray and its ingredients, block chocolate and block licorice.

B. Status: Solutions of block chocolate, block licorice, and burley spray will be held at temperatures emulating those of production, under laboratory conditions for up to 72 hours. Changes in the base solutions and the burley casing will be monitored periodically during the holding time. Concurrently headspace samples will be collected and mass balance determinations made.

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being prepared in the lab for further packer development work since production packets have been unacceptable.

C. Plans: Celanese has recommended a contract packager who has experience producing medical packets using Celgard. R&D and Engineering personnel will visit this packager to assess their capabilities. Aging trials of the cellulose triacetate film with the new backing will be initiated.

III. KAYMICH DIRECT MENTHOL APPLICATOR

A. Objective: Evaluate a Kaymich direct menthol applicator as an alternative mentholation process.

B. Status: Cigarettes mentholated via a 6 hole nozzle versus a 4 hole nozzle gave the same level of menthol in smoke, however, tipper performance was unacceptable with the 4 hole nozzle due to menthol bleeding through the paper. Menthol losses at the maker continued to run approximately 5-7%. Further improvements in machine performance were attempted during a 7.5 hour test with an 8 hole nozzle and a cooling bar to reduce menthol losses at the maker. Losses at the maker were the same as before. Samples are currently being analyzed. Also observed during the extended test was an unexplainable electronic failure which according to Kaymich, has been observed by them in the past.

C. Plans: As a result of a meeting between Semiworks, Tobacco Materials, Product Development and Cigarette Technology personnel, an additional trial run will be made to subjectively evaluate a Kaymich model versus a menthol-on-foil control using the best machine configuration currently available. Additional development work will be pursued pending the results of this trial.

IV. EMBOSSING TECHNOLOGY

A. Objective: Explore embossing technology for potential new product development.

B. Status: Fabrication of the second generation laboratory embossing unit is on schedule and delivery is expected in about two weeks. Development work continues with Intaroto on new embossing designs for improved product capability. Several promising prototypes should be available in October.

C. Plans: Continue providing support to Engineering as needed for new product development.

V. MENTHOL ON FOIL

A. Objective: Support the introduction of the menthol on foil process.

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PROJECT NUMBER: 2107
PROJECT TITLE: Filter Research & Development
PROJECT LEADER: C. J. Campbell
PERIOD COVERED: September, 1988

I. FILTER RESEARCH & DEVELOPMENT GROUP

A. Objective: Consolidate efforts on filter research and development into one group and actively pursue the development of improved filter systems.

B. Status: A meeting with R&D at FTR was held on September 20 to exchange information on filter development projects. The goals and specific activities of PM USA's new Filter Research and Development project were presented and discussed. FTR presented a status report on their pertinent work including tube-in-tow, and CA web vs paper. A meeting was also held with Intertaba to discuss their capability of processing paper and CA web into filter rods.

II. FILTER SUPPORT FOR MAJOR PROGRAMS

A. Objective: Provide design assistance and potential new filter systems for major R&D programs.

B. Status: Design assistance and testing of filter effectiveness continues on several major projects.

III. CELLULOSE ACETATE WEB

A. Objective: Explore the potential advantages of CA web for use as a high efficiency filter material.

B. Status: Dexter continues to delay the manufacture of the experimental CA web rods we requested because they have not supplied the web material to Celanese. A clear reason for this delay is not apparent, but Celanese management has become involved. Celanese now expects to deliver samples the third week in October.

C. Plans: Evaluate samples for efficiency and subjectives.

IV. IMPROVED MENTHOL STABILITY

A. Objective: Investigate methods of improving the stability of menthol delivery in smoke in aged cigarettes.

B. Status: Samples of filter plugs made by Filtrona with their steam cured process have been made into menthol cigarettes and are now in accelerated ageing. Menthol content of the filter during ageing and delivery of menthol in smoke will be compared to a

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B. Status: Mentholated foils were prepared for Product Development, Filter R&D and FML Development during September.

The third mentholator control problem has not been corrected yet by Engineering due to priorities.

C. Plans: Produce samples as requested. Qualify the third mentholator for use in Semiworks when operational.

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B. Results: A Richmond team visited Neuchatel during the week of 9/19/88. Based upon subjective evaluation of prototypes by the Project Famous team and by Panel A, the following recommendations were made:

a) Launch Prototype 23P in Germany 11/21/88. This is the Famous Flavor B prototype at 14 mg. tar.
b) Launch Prototype 2P in Belgium 11/21/88. This is the Famous Flavor B prototype at 16 mg. tar.
c) Consumer test 23P and the Italian/French Chesterfield vs. Camel in Switzerland.
d) Consumer test 2P and the Italian/French Chesterfield vs. the respective Camels in Holland and France.

C. Plans: Consumer test results from Switzerland, Holland, and France are expected by year's end.

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was also updated to clarify operating procedures for TMCI.

C. Plans:

1. Evaluate the mechanical modifications made to improve the Tarragona plant operation by running trials using Spanish tobacco ground in Spain to 95% <400 mesh.

2. Grind the Spanish tobacco blend to 95% <120, <200 and <400 mesh to optimize the tobacco particle size necessary to produce a higher quality ASTA sheet in Tarragona.

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A. Objective: Development of a product to be competitive to Pine Tree King Size.

B. Status: Blend has been designed by Blend Development for flavor evaluations.

C. Plans: Development of casing and aftercut sytem.

MARLBORO IMPROVEMENT PROGRAM (AUSTRALIA)

A. Objective: Develop an Australian Marlboro subjectively closer to the U.S. Marlboro.

B. Status: Prototypes received involving blend and flavor modifications.

C. Plans: Evaluations of prototypes.

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*N/R = No Report

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PROJECT NUMBER: 2307
PROJECT TITLE: Flavor Investigation/Nonvolatile Flavor Investigation/Process Tobacco
PROJECT LEADER: W. R. Raymond
PERIOD COVERED: September, 1988

I. FLAVOR INVESTIGATION

A. Objective: To provide analytical support for activities related to development and application of flavoring materials.

B. Results:

1. Project ART Two samples (0 M/M, 200 M/M) of the residue from the liquid CO_2 were partitioned between hexane and methanol-water (90-10). The G.C. scans of the hydrocarbon fractions (hexane soluble) were identical, and the G.C. scans of the oxygenated components (methanol soluble) showed only minor differences.

Work continues on identification of the oxygenated components of the waxy materials from the liquid CO_2 extracts.
A new HPLC procedure has been developed for the quantitation of underivatized amino acids, (Glutamic acid, Leucine) in casing 149.

GC and GC/MS of an extract obtained from casing 149 showed pyrazine, alkyl pyrazines and methanol alkyl pyrazines. Very little of any high molecular weight material was found in the extract.

2. Low Density Rod - Aftercut Study Anethole was determined on twenty-three samples of low density rod filler. Three samples of aftercut for the low density rod filler were also profiled and anethole quantitated.

3. Half-Pint Casings and Aftercut Analytical work is almost complete on both the aftercut and casings for this POL.

A new HPLC procedure is being developed to analyze a mixture of ethyl esters of citric acid.

4. Miscellaneous GC profiles and GC/MS component identification continued with the analysis of flavor 04-245 (Imitation Jasmin). GC profiles were also run on four Trim flavors in a stability study.

Headspace analyses were run on several samples:

a. five printed PET sheets
b. Rothman Cartier cigarettes
c. Five samples of customer complaints.

II. NONVOLATILE FLAVOR INVESTIGATION

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2. Pilot Trials - Trials were conducted at the University of Maine to produce cigarette papers on their pilot machine (12 inches wide; 30 feet/minute). Equipment modifications and process adjustments were made as necessary to achieve satisfactory sheet appearance and the desired machine-direction fiber alignment. Low chest consistencies were required to prevent roping of the long flax fibers. A headbox fiber consistency of 0.2% gave excellent sheet formation and eliminated visual pinholes. A dandy roll was installed to improve formation and reduce porosity.

   Sheets were produced at normal cigarette paper porosity (~35 ml/min Coresta), but the low porosity target (13) for the experimental paper program was more difficult to attain. Some papers were made at standard weight (25 gm/m^2), but the majority were run at 40 gm/m^2 to reduce porosity. Calcium carbonate filler targets (30%) were met. Increased refining resulted in 40 gm paper at a porosity of 19 using Pfizer Abacar 5970 carbonate (2.0 microns); a porosity of 12 was achieved on the same stock using Pfizer Multiflex MM carbonate (0.07 microns).

C. Plans:

1. Produce handsheets to evaluate ultrarefining, a wide weight length distribution and paper compaction as means of reducing paper porosity.

2. Arrange a second set of trials at Maine for November.

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A. Objective: To investigate tobacco-natural, tobacco-identical and other nonvolatile fractions and constituents for potential application as cigarette flavor additives.

B. Results:

Burley Extract GC and GC/MS profile was run on a Burley fraction D-2 (B. Taylor). Identification of the components included several esters, hydrocarbons, phthalates, iononer and related compounds. Nicotine was found as a minor component in the extract.

III. PROCESSED TOBACCO:

A. Objective: To develop basic and applied knowledge for the purpose of improvement or selective modification of subjective properties of processed tobaccos.

B. Results:

Dry Flavor Replacement Work continues on developing an analytical procedure to monitor SJBR (St. John's Bread, Roasted). Work is also ongoing to obtain a consistent product from different suppliers.

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C. Conclusions: Pyrolysis and combustion for materials are now complete except for one sample. Temperature profiles are being plotted and data examined.

D. Plans: A report on the study findings will be prepared.

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III. PROJECT NATURAL

A. Objective: Phase I - To develop "All Natural" cigarette candidates with no additives to the tobacco.

B. Status: Results of POL's 4432, 4433 and 4434 showed Blend C to be the most favorable of the three natural blends tested.

Component dampening effect on spotting information will be available during the week of 10/3/88. PMI 100's FTB (Blend C) information regarding spots from Stockton Street filler will be available week of 10/3/88. Numerous cigarette papers will be evaluated during the month of October on Blend B for spotting.

Menthol models for POL 3598 (97K flavor system) were made the week of 9/26/88. Three PMI production cigarette models (2 Blend B models with different cigarette papers and 1 Blend C model) were made with mentholated foil and 1x menthol in the filter.

C. Plans:

Study Anti-Spotting Papers	10/88
Menthol	On-going

IV. PROJECT EXTRA

A. Objective: The development of 4-8 mg product candidates that have the taste of products with twice the tar.

B. Status: Evaluation of low density rods and flavor application studies continue. The cigarette models for the Aftercut study have been completed. Subjective evaluations have been initiated. The casing study models, which consisted of four casings, have been subjectively evaluated. Results indicated that 8493-188A casing is the best of those tested for the Low Density models.

A program to develop a 6mg free-standing cigarette which appeals to flavor low smokers was initiated. Three blends, recommended by the Leaf Department, have been evaluated with one chosen for Aftercut work. Models are currently being made with two different Aftercuts for evaluation.

Evaluation of paper filters continues. Subjective comparison of cigarettes constructed with paper/CA dual filters (Intertaba vs. Filtrona vs. Baumgarter) is in progress.

C. Plans:

Evaluate paper/ca filter variability	4th Qtr. '88
Evaluate alternate filters	On-going
Puff profile	On-going
Low density rod program	On-going

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PROJECT NUMBER: 4024
PROJECT TITLE: Japan Product Development
PERIOD COVERED: September, 1988
WRITTEN BY: S. B. Nelson

I. MERIT LIGHTS

A. Objective: Development of a 7 mg tar to compete with Mild Seven Lights and mainstream Japanese smokers.

B. Results: A Danchi test has been sent to determine the subjective impact of filter length on this product. 21mm and 27 mm versions of the Merit PMI series presently in Japan will be evaluated this month.

C. Plans: Results of this Danchi and the Merit PMI's 5190-5193 will be available late this month and final product decisions will be made at that time.

II. CHESTERFIELD

A. Objective: Develop an 11 to 12 mg American blended product.

B. Results: The first Danchi test results have been analyzed. Both Chesterfield models and Lucky Strike were rated equally by liking scores. The fourth model, Camel Mild, was rated significantly lower.

C. Plans: Awaiting results from a second Danchi and a PMI test versus Lucky Strike.

III. MARLBORO

A. Objective: Improvement to the subjective response of the Marlboro Full Flavor product.

B. Results: Danchi panel results of a new Marlboro Full Flavor for Japan have been analyzed. The new Marlboro was rated higher by liking scores than the other three models included in this test.

C. Plans: Future product decisions will be made when results of five additional PMI tests are analyzed from the Marlboro Matrix program.

IV. MOMENT

A. Objective: Development of a menthol product acceptable to the Japanese consumer.

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PROJECT NUMBER: 2304, 2305, 4015
PROJECT TITLE: New Product Development
PROJECT LEADER: B. G. Taylor, H. Maxwell, J. B. Easley, and L. S. Wu
PERIOD COVERED: September, 1988

I. MARLBORO ULTRA LIGHTS

A. Objective: To develop 85/100 mm Ultra Low (6 mg) candidates for Marlboro line extensions.

B. Status: POL's 4444 (West German Berlin Marlboro Lights 85mm vs. MUL 85mm) and 4445 (West German Berlin Marlboro Lts. vs. Half Pint 85mm) have been shipped. POL 4443 (MUL 85mm vs. Philip Morris Lights American 85mm) and POL 4442 (Half Pint 85mm vs. Philip Morris Lights American 85mm) will be shipped when panelists are available.

Models to evaluate blend reformulations were produced in both the 85mm and 100mm designs for Internal Testing. Blends include the revised LDB-2 and a modification of the revised blend (25% BLDET) for greater latitude in puff count control. The cigarettes are being evaluated on the MC Panel.

A new blend (LBD-3) and new casings and flavors are being made in Semi-works and will be evaluated against the current LBD-2 blend and the LBD-3 blend with current casings and flavors.

C. Plans:

Puff Count Modifications/New Blend Evaluation	10/88
Phase IV POL Tests	4th Qtr. '88
Ad/Pack Testing	4th Qtr. '88
Test Market	1st Qtr. '89

II. Virginia Slims K.S.

A. Objective: To develop Virginia Slims 85mm products in both conventional and reduced sidestream versions, at 23.0 and 20.0mm circumferences.

B. Status: Prototypes have been made and are currently being evaluated using standard and low sidestream cigarette papers at 20.0 and 23.0mm circumference. The blends currently under evaluation include the Virginia Slims blend and the Trim IV blend. Flavor development and evaluation is currently underway. Several low sidestream cigarette papers are currently being evaluated.

C. Plans:

Prototype Production/Evaluation	On-going
Flavor Development/Evaluation	On-going

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PROJECT NUMBER: 4022
PROJECT TITLE: International Product Development
PERIOD COVERED: September, 1988
WRITTEN BY: A. H. Confer

I. PROJECT TOLSTOY (ASIA/PACIFIC REGION)

A. Objective: Develop an upscale Russian-style cigarette.

B. Results: A prototype with 20% ventilation (12 mg. tar, 6.5 puffs) was submitted to Hong Kong management. An approximate machinery cost analysis indicated a cost of $100K for converting each cigarette maker. Estimated lead time for conversion is 6 months. Production rate is estimated to be 1,000 cigts./min.

C. Plans: Feedback from Hong Kong will guide further development.

II. PROJECT DRAGON (PEOPLES REPUBLIC OF CHINA)

A. Objective: Develop a "blended" KS cigarette to be a non-PM trademark owned and manufactured by CNTC. Tar targets: 17-19 mg. (GCF-2 factory), and less than 15 mg. (ZCF factory).

B. Results: A book summarizing blends, casings/flavors, and cigarette construction for the proposed prototypes at ZCF is being completed.

C. Plans: The book will be sent to Hong Kong for translation, and sample quantities of the leaf grades and casings/flavors will be sent to ZCF.

III. MARLBORO IMPROVEMENT (AUSTRALIA)

A. Objective: Modify the Australian Marlboro to bring it subjectively closer to the USA product.

B. Results: Three blends were subjectively evaluated vs. USA cut filler. All cigarettes were made to Australian Marlboro cigarette specs. Two blends were recommended for trial production in Australia.

C. Plans: It is anticipated that the two trials will be conducted in Australia, with possible consumer testing.

IV. PROJECT FAMOUS (WORLDWIDE)

A. Objective: Optimize Chesterfield as a worldwide competitor to Camel.

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PROJECT NUMBER: 5001
PROJECT TITLE: Packaging Studies
PROJECT LEADER: H. R. Dunaway
PERIOD COVERED: September, 1988

PACKAGING STUDIES

A. Objective: Provide technical packaging support to Manufacturing, Manufacturing Services, Engineering, Purchasing, and Quality Assurance. In addition, assist New Products Directorate in evaluating new packaging concepts and products.

B. Status/Plans:

Residual Printing Solvents in Packaging Materials: Evaluation of the following items was coordinated in the past month.

- Marlboro Red Ink (C565) wet sample from VFB
- Merit UL KS SP 20 (4L-903A/GB)
- Marlboro KS SP 20/200 (3C-907A/VFB)
- Printed Humidor packet materials from Reynolds
- PPG WATER Lacquer SWG-700-450
- Pressure-sensitive t/t & printed coupon on mobil poly (Patton)
- Marl Lts 100 SP 20 (JWF)
- Chesterfield 70mm SP 20
- Lark Milds KS SP 20 (35-206A/IPC)
- Lark FF KS SP 20 (35-052E/IPC)
- PM Super Lts KS FT 20 (22-909A/500A/SP)
- Chesterfield 70mm SP 20/200 (53-233A/VFB)
- Lark FF, Super Lts, Milds SP closure (JWF)
- PMI INT 100 FT 20 (3F-340B/ALF)
- Marlboro LS FT 20 (3F-909D)
- Gold line tear tape w/pre-applied adhesive & UV scanning
- PMI LE 100 FF FT 20 (24-346B/RCS)
- PMI LE 100 LTS FT 20 (4E-346A/RCS)
- BUCKS KS & 100 SP 20
- Gridlock NonFilter KS SP 20 & 20/200
- Project GE Cohesives and Lacquer
- Alpine Singapore Ink Samples from JWF
- Merit UL KS SP 20 (4L-903A/GB)

Purchasing was advised on the acceptability of the above items for use in production, and where necessary, recommendations were made on the proper handling prior to use.

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D. Plans: October, 1988

1. Further evaluations of the fatty acid alcohols in conjunction with fatty acids will be conducted.

2. The C-10 and C-12 fatty acid alcohols will be tested in the Phase II, SEL shake-flask assay.

3. Evaluations of the C-10 and C-12 fatty acids and fatty acid alcohols will be initiated in the Phase III fermentor screen.

4. Dissolved oxygen, pH and temperature measurements will be made by Project 1730 and Park 500 personnel at selected locations in Line 2 of Park 500 in support of the design and establishment of a Park 500 model system at the R&D labs.

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mobile phase additives in GC has begun; a candidate compound was prepared and purified (by R. Izac) by HPLC.

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PROJECT NUMBER: 1307
PROJECT TITLE: Reconstituted Tobacco Development
PROJECT LEADER: R. G. Uhl
PERIOD COVERED: September, 1988

I. IMPROVED SHEET PROPERTIES

A. Objective: Improve the physical characteristics and blend properties of reconstituted sheet materials.

B. Results:

1. ART Project - POL cigarettes to evaluate the acceptability of using half of the ART stems in RL are being processed through Semiworks make/pack. Pilot RL is being used as both the control and test sheet since the limited quantities of ART pilot plant spent stems preclude a Park 500 trial. Utilization of half of the projected available ART stems equates to 6 1/2% of the RL feedstock.

   POL quantities of pilot RL have also been made at the full ART stem utilization level (13% of the RL feedstock). Separate sheets were made using ART stems dried by two different modes, i.e., stems directly dried in a rotary dryer after leaving the ART absorber and ART stems subjected to an IS treatment (superwetting and Hauni tunnel superheating prior to drying). Small-scale cigarettes containing these sheets have been submitted for analyticals and will be evaluated by the Flavor Development panel to determine whether IS treatment enhances ART stem acceptability in RL, and whether POL evaluation of the full ART stem inclusion level is warranted at this time.

   ART stems were used to replace 26% of the RCB feedstock (utilizes half of the ART stems) in RCB handsheets. Test sheets were made three ways, i.e., ART stems replacing burley stems, replacing production dust, and replacing both (50/50). Since RCB does not normally contain bright stems, and since the latter two formulations represent higher total stem content, "special control" handsheets were also made with virgin bright stems. These sheets are being subjectively screened in handmade 100% cigarettes.

2. Humectants - The POL cigarettes for the evaluation of glycerin-free blends have been rejected for tar delivery. Due to the age (~1 year) of the special glycerin-free Production sheet materials, ET and ESB used for the test cigarette, fresh samples of these materials will be produced for use in a cigarette remake. The remade sheet materials, etc., will be screened for subjective acceptability prior to their use in the POL blends.

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   Small scale cigarettes of first-round PG/glycerin-free blends are being subjectively screened; initial results are promising.

Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

8. Ryan, L. Memo to J. Wajntraub. Cypermethrin®. September 1, 1988.

9. Ryan, L. Notebook No. 8533, p. 13.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

C. Plans: Since there is still interest in producing an acceptable G-free cigarette and no more G-free feedstocks are available, G-free RL will be remade at Park 500 and G-free RCB will be remade at the BL Plant. Flavor Development will handle the remaking of G-free ESB and DIET (2).

D. References:

1. Mooz, E. D. Notebook No. 8599.

2. Ruziak, S. Personal communication to E. Mooz. 1988 September 22.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 1810
PROJECT TITLE: Project ART
PROJECT LEADER: Ravi Prasad
PERIOD COVERED: September, 1988

I. PROJECT ART

A. Objective: To support commercial Plant Design and Flavor Development objectives at the Bermuda Hundred Pilot Plant.

B. Results: Pilot Plant tests with the third master batch of DL blend (DL-3) indicated that the extractability of this batch is similar to the earlier batches, i.e., 97% nicotine extraction can be achieved at standard process conditions.

In preparation for the expected test market production, a series of tests were completed to reduce the absorber pressure drop, via changes in CRS cuts-per-inch. The lower pressure drop obtained with lower CRS cuts-per-inch allows higher CO_2 velocity and reduced cycle time for maximum production. Final stem type selection will be made when nicotine profile data is available.

With the postponement of the plans for the test market of ART cigarettes, the emphasis was shifted toward the flavor development objective. Several tests designed to evaluate the effect of CO_2 soluble tobacco waxes, on flavor and spotting were completed. Measurement of pet ether extractables confirmed that the wax distribution is more uniform in "cold recovery" as designed for commercial operation, compared to "hot recovery" as practiced at the pilot plant. Based on this result, "cold recovery" with wet casing was chosen as the best option for flavor development activity.

A "wax filter" concept was tested at the pilot plant with directional success in reducing the heavy wax-laden layer of filler experienced in the present operation.

Special samples of extracted filler with and without the wax layer, were evaluated for spotting. Preliminary data indicates that increased spotting experienced with ART cigarettes is due to the presence of tobacco wax at the outside surface of the filler shreds.

Support for Bermuda Hundred plant was provided via training of the production supervisors/superintendents. In addition, design of a "hot CO_2 gas" system for the pilot plant was completed to allow the testing of commercial plant CO_2 recovery design. A 650 was submitted for approval.

C. Plans: Continue production in support of flavor development activity.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

and lactate salts were so high (>5%) that the product would be subjectively unacceptable. Hydroxide solutions (calcium, magnesium, sodium, potassium) were also entered into the model. Of these, only the sodium and potassium hydroxides were soluble at the required concentration for casing the filler. Cigarettes will be prepared with these solutions for subjective evaluation.

Extracted filler was expanded in D Pilot Plant for product development work on low tar ART cigarettes. The preferred tower temperature for ART filler is in the range of 500-550F.

C. Plans: Identify the necessary primary processing and/or equipment requirements to reduce spots on ART cigarettes.

Continue to evaluate in the laboratory alternate acids and bases for potential utilization in the ART process.

III. BINDER DEVELOPMENT

A. Objective: Develop methods to produce binder systems for the foam bonded ends and low density rod programs.

B. Results: For foam bonded ends, solutions of NaCMC, containing lower than typical licorice additions (0.5, 0.75, 1.0 vs 2.0%) were tested on the Molins apparatus. Following laboratory testing of the foams produced from the different solutions, a test run was made with a 4% NaCMC/1% licorice solution to produce cigarettes for loose ends and subjective evaluation. The 1% licorice appeared to be beneficial producing a less stable foam which broke and absorbed into the cigarette in less than one minute.

C. Plans: Continue to provide support as required to the above programs.

IV. TMCI-ASTA SHEET

A. Objective: To develop a subjectively and physically acceptable reconstituted tobacco sheet using the TMCI process and PM-RCB technology for international application.

B. Results: Tarragona ASTA products were judged to be only slightly different subjectively from RCB at 7% in a Spanish Marlboro blend. Further evaluation will be made using ASTA from future trials when processing conditions will be improved. The Spanish tobacco was received for grinding to three different degrees in NuWay Tobacco Company. These products will then be used in Tarragona to optimize the particle size for improved ASTA physical quality.

The Tarragona plant was visited and further mechanical changes were seen to be necessary.

The first drawings of the Cadiz ASTA installation were reviewed and comments were returned to TMCI. The process technology manual

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 1757
PROJECT TITLE: Analytical Flavor Specifications
PROJECT LEADER: M. L. Zimmermann
WRITTEN BY: B. B. Baronian
PERIOD COVERED: September, 1988

ANALYTICAL FLAVOR SPECIFICATIONS

A. Objective: To develop analytical and sensory specifications for incoming flavors and materials for use at the Flavor Center and other QA facilities.

B. Results: Analytical and subjective assistance was provided to QA to help address an issue regarding a questionable lot of incoming material. On-site training of subjective methodology was also provided to the QA staff. Collaboration with QA is expected to continue on an as needed basis.

Specifications for the flavors purchased from one vendor have been developed. Approximately one half of the materials from a second vendor have completed specifications. Several analyses of PMI samples have been performed to confirm compliance to German standards.

As a result of staff changes, cross training of personnel is occurring to meet the projects needs.

C. Plans: Complete specifications from second vendor and begin evaluations of the next vendors materials.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

International Brands Smoking Panel

A. Objective: Subjective evaluations (rod aroma and smoking characteristics) of cigarette brands in the international market.

B. Status: Seven panels completed.

C. Plans: Provide assistance as needed.

PROJECT LIGHT/ULTRA

A. Objective: Develop cigarette models at 4, 6 and 8mg with a new blend and flavor system.

B. Status: Awaiting results of P.M.I. testing.

PROJECT MOUNT ULTRA-JAPAN

A. Objective: Explore the use of new blends, new flavor systems and different construction styles. Cigarettes will be in the low and ultra-low category for the Japanese market.

B. Status: Awaiting Danchi test results.

PROJECT AVALON

A. Objective: Development of casing and aftercut systems for a regular and mentholated product for the Asian market.

B. Status: Models using two blends, two casing systems, eight aftercuts, and two menthol application methods are being made.

C. Plans: Evaluations of prototypes.

PROJECT STARSHIP II

A. Objective: Produce a 12mg cigarette for the Japanese market.

B. Status: Awaiting Danchi results.

MEXICO

A. Objective: Modifications of existing flavor systems used.

B. Status: Awaiting consumer testing results.

PROJECT OLYMPIC (KOREA)

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 2306
PROJECT TITLE: Marlboro Standardization and International Support
PROJECT LEADER: Janet L. Spruill
PERIOD COVERED: September, 1988

I. MARLBORO STANDARDIZATION

A. Objective: Analytical and subjective evaluations of production Marlboro KS/LS.

B. Status: July 12 factory pick-up completed. Factory pick-up from 7/19 in progress. Standard Run VI for all factory locations is planned for week of October 17.

C. Plans: Analytical and subjective testing of two production dates.

II. DOMESTIC CIGARETTE DEVELOPMENT PANEL

A. Objective: To provide subjective direction for programs within R&D and manufacturing locations.

B. Status: Eleven panels completed during the reporting period as well as four samples evaluated for the Menthol Aging Study. Two profiles completed and twenty-two ART samples evaluated.

C. Plans: Provide assistance as needed.

III. PROJECT NATURAL

A. Objective: To develop 85mm and 100mm full-flavored and lights prototypes using blend components and flavor systems which will result in a natural blended product.

B. Status: Casings and aftercut prepared for primary run of "Limited" model. Primary run was observed.

C. Plans: Analytical and subjective evaluations of "Limited" model.

IV. FLAVOR RESOURCE DATA BANK

A. Objective: Creation, customization and maintenance of flavor resource and data files for use by Flavor Development Division.

B. Status: Ten new vendor samples have been injected for subjective evaluations. Thirty flavor samples have been entered into the data base.

C. Plans: Division updated with information.

V. INTERNATIONAL SUPPORT

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

V. Project 202

A. Objective: To develop a 2-3mg "Merit-type" cigarette.

B. Status: This is a spin-off of the Extra Project.

Three monadic POL tests were shipped in July. These tests are as follows: 1) #0158 - modified Half Pint blend with 25% expanded, Half Pint casings and AC, paper/CA dual filter, and white tipping; 2) #0159 - same as #0158 except it will have cork-on-white tipping; and 3) #0160 - PMSL blend with PMSL casings and AC. Initial results look encouraging for the modified Half Pint blend.

Three cased blend models were made using experimental blends developed by Leaf Department. Cigarette models are to be used to evaluate blends and as a base for aftercut development.

POL 0167 (PM Ultra Lights - Europe) was shipped 9/14/88.

C. Plans:

POL 0167 - Results	10/88
Additional 202 POL Candidates	10/88
Results from POL's 0158-0160	10/88
Evaluation of Filters and Blends	On-going

VI. PROJECT VALUE ENTRY

A. Objective: To develop products to compete in the Value Entry Categories

B. Status:

ALPINE

Test market in progress.

A factory trial is scheduled for Cabarrus the week of 10/3 using the new Alpine blend in full flavor king size and 100's. A factory trial is scheduled for Louisville the week of 10/10 to produce the 80mm FTB full flavor and lights versions. Production start ups for these brands are scheduled for 10/17 in Cabarrus and 10/24 in Louisville.

TARGET

A POL is planned of Target vs Winston.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

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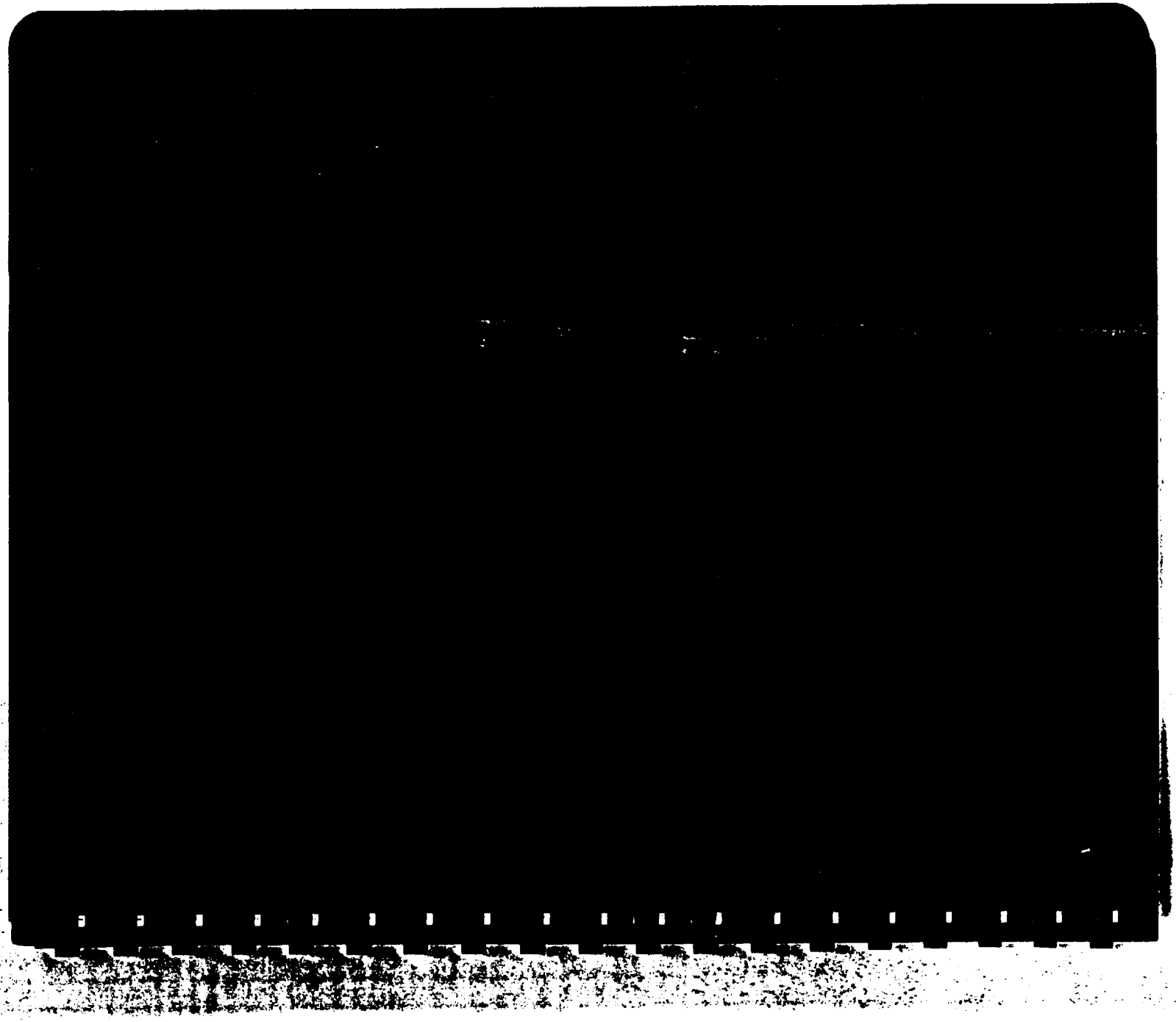

Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

III. GLOBAL HOLONETICS "SMART CAMERA"

A. Objective: Evaluate the Global Holonetics "Smart Camera". Determine its effectiveness in discriminating between good and defective packs.

B. Plans: Further evaluation of the "Smart Camera" has been postponed until a stable prototype is available. No availability date has been established.

IV. AEROSOLS RESEARCH (T. Nguyen)

A. Objective: Develop and characterize a laboratory aerosol generator capable of producing highly concentrated condensation aerosols.

B. Results: The generator's cooling chamber has been redesigned to reduce the variation in temperature across the tube's cross section. The redesign was aided by heat transfer calculations carried out at different design parameters.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

Pilot RL sheets containing individual humectants have completed survivability trials in Semiworks. Data analysis is in progress.

C. Plans:

1. Insure the availability of pilot RL containing ART stems to support POL testing.

2. Determine whether Hauni thermal treatment enhances ART stem subjective acceptability in RL; determine the subjective effects of adding ART stems to RCB.

3. Produce RCB handsheets to evaluate the subjective benefits of increased sugars in glycerin-free (CT-free) formulations.

II. SUBJECTIVE MODIFICATION OF RL

A. Objective: Improve or modify the subjective character of RL.

B. Results:

1. Dry Flavor Replacement - Flavor Development has tied individual sugar levels in liquid flavors to the degree of pre-extraction roasting. This is a reiterative process in that sugar values are reported back to the vendors (Chart, Madis, and Takasago); the vendors in turn make process adjustments and submit new native extract samples for analysis. Coinciding sugar analyses should improve subjective parity among the three sources.

2. Modified 150B - The electronics for the Branson ultrasound unit were installed and piping modifications made to allow installation of the ultrasound processing cell, when received, without pilot plant downtime. The size service moyno pump was rebuilt to provide the required process pressure.

C. Plans:

1. Produce pilot RL to evaluate liquid flavors, as available.

III. CIGARETTE PAPER DEVELOPMENT

A. Objective: Support development of proprietary low sidestream cigarette papers.

B. Results:

1. Handsheets - Installation of equipment in the new cigarette paper handsheet laboratory is completed, and the first handsheets have been made.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

determine the suitability of a laser as the light source for visibility measurements gave disappointing results. The light was not nearly as stable as that from the quartz halogen lamp and the visibility charts were considerably noisier. For the present, either the quartz halogen or the Xenon arc lamps will continue to be used. A hood has been designed and built for the 8-port monitor. The smoking machine has been checked out and has the optical system installed. (5) A meeting was held with Borgwaldt representatives in regard to an in-chamber smoking machine. They will respond to construction and modification questions shortly. Software packages for control of cigarette smoking and data collection are being evaluated by CAD personnel.

D. Plans: (1) Continue optimization of methods for analysis of sidestream gas phase. (2) Visibility and CORESTA MS and SS measurements will be run as required. (3) Results of the "EC" chamber smokings will be compared with data generated previously with the PM and European chambers. Additional modifications will be made as necessary. (4) Construction of the 8-port visibility apparatus should be completed in the next month. Smoking runs will commence shortly for instrument check out and determination of data precision and reproducibility. (5) Long term problems inherent in the proposed chamber construction will continue to be addressed in anticipation of 650 approval.

II. MISCELLANEOUS

A. A study is underway utilizing the Texmar unit as a potential instrument for analysis of tobacco volatiles.

B. Pyrolysis/GC/MS and GC/MS analyses continue as requested.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 1333
PROJECT TITLE: Semiworks Process Control
PROJECT LEADER: D. A. Phan
PERIOD COVERED: September, 1988

A. Objective: Evaluate and revise the process control and data acquisition system to improve processing performance and production quality.

B. Results:

Hauni HT Steam Tunnel Installation (Oliver) - Installation of the Hauni HT steam tunnel before the Adt dryer at the Semiworks was completed and system checkout was done the week of 9/19. An initial test with standard factory Marlboro filler was performed on 9/29 by Dr. Cho. Several conditions were tested with different spray steam pressures and the dryer being operated in co-current and counter-current air flow. Other punch-list items will be completed by the end of October.

Temperature Control System for Scandia Overwrappers (Osmalov/Phan/Sims) Work is underway to provide all necessary electrical and mechanical modifications for evaluation on one of the Scandia overwrappers at the Stockton St. plant per factory request. System startup is planned on 10/8.

Second Aftercut Flavor Cylinder (Phan/Sims) - Most of the instruments have been received. The Provox configurations were revised and the aftercut control panel was rewired to accomodate the connections of the second aftercut system. The Fenwal fire and explosion suppression system for the cylinder is scheduled to be installed by 10/30. Electrical and control installation is planned to begin the week of 10/31 and completed by 11/11. This flavor cylinder should be on-line by 11/15.

Final Product Automatic Reject System (Oliver/Sims/Medek) - The final product rejection system was installed and checked out successfully. This system automatically rejects final product based on the corrected QB2 moisture readings at the final weighbelt. The allowable moisture tolerance band can be adjusted and the system can by bypassed from the primary control room.

On-line Moisture Measurement (Phan) - A purchase order was issued for an on-line MM55 moisture analyzer from Infrared Engineering for evaluation in the Semiworks primary. This meter is scheduled to be installed by 11/30 at the final weighbelt.

C. Plans - Complete the checkout of the Scandia temperature control system for the Stockton St. plant and installation of the Fenwal fire and explosion system for the second aftercut cylinder. Continue providing support to the Hauni HT steam tunnel evaluation program, development of the Onspec control software and qualification of the Computrac moisture analyzers. Continue providing electrical plant engineering support to the Semiworks and conduct routine QA functions.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

the control except for the higher CA++ (6-7%) levels; 5) BuCEL + BrBW with added Ca++ produced CSCs with higher S.A.s than their respective controls; however, the differences were not significant in all cases; 6) as anticipated, there were no distinct patterns to indicate a concentration response of added Ca++ in regards to S/M activity; and 7) as the amount of added BuCEL increased, S/M activity IT CSC S.A. generally increased.

C. Plans: An experiment is being performed which will determine the effect Ca++ has on the S/M activity of the CSC from BuCEL + BrBW filler that has a constant solids add-on weight. A Special Report will then be prepared to document all salt-effect studies.

D. Reference: Thompson, L. H. Notebook No. 8628, pp. 185-186.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

D. Reference:

Magin, D. Notebook 8660, p. 51.

IV. OPTIMIZATION OF A LOW ACTIVITY MODEL: MS NITRIC OXIDE CONTENT

A. Objective: To develop methods of reducing MS NO delivery for a low activity model.

B. Results: Filler from a BCR reference blend was oversprayed with 3% ascorbyl palmitate to determine whether addition of this antioxidant might lower NO delivery. Analysis of the corresponding smoke by the peroxide/nitrate ion selective electrode procedure developed last month showed that the treatment yields a marginal 11% reduction in NO delivery compared to the untreated control.

C. Plans: Spraying of squalene and neophytadiene as possible NO scrubbers on filler will be evaluated.

D. Reference:

Levins, R. J. Notebook 8672, p. 70.

V. SUPPORT FUNCTION: CONDENSATE PREPARATION

A. Objective: To fabricate cigarettes, perform smokings, and prepare condensate as needed for biological and chemical analysis.

B. Results: Thirteen samples prepared as part of the Crossed Solubles Base Web Study were sprayed on the specified fillers, and cigarettes made and smoked for S/M testing, along with the appropriate controls. In addition, 30 2R1 cigarettes were smoked and the smoke processed for EGF assay.

C. Reference:

Hellams, R. D. Notebook 8613, p. 111.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

The summer intern has returned as a PM Temp. and will be assisting in material evauations two afternoons a week.

C. Plans: Materials evaluation is a continuous program.

IV. UNEXTRACTED NICOTINE

A. Objective: To quantitate and characterize unextracted nicotine.

B. Results: Work this month continued on samples reflecting different treatments and extractions of ART filler from project 1902. Results were reported to Dr. W. Hempfling.

C. Plans: Continue to analyze samples provided by Dr. Hempfling in an attempt to further characterize the source of unextracted nicotine.

V. RESPONSE TO ANALYTICAL REQUESTS

A. Objective: To provide analytical support to R&D and Operations personnel and projects.

B. Results:

Analyses and investigations by project personnel during the month of September included:

Ethanol determinations were provided for Marlboro Lights Menthol KS and 100's FTB to estimate the loss of ethanol after the menthol on foil application and after packaging cigarettes. Little or no loss of ethanol was observed 12 hours after foil application and 12 hours after packaging.

Samples from project 2525 were analyzed for nornicotine.

Routine determinations were made of metals in leaf material, treated stem material, and filler using x-ray fluorescence and atomic absorption procedures.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

C. Plans:

Alpine Factory Trail	10/88
Alpine Production startup	10/88
Alpine National Introduction	1/89
Target Ad/Pack Testing/Factory Trial	On-hold

VII. B&H KING SIZE

A. Objective: To develop a B&H 83mm box product with comparable subjectives of B&H 100 in both a full flavor and lights version, both nonmenthol and menthol.

B. Status: POL 0164 (B&H King Size Full Flavor) and POL 0165 (Lights version) initial results look promising.

A series of Ad-Pack and Consumer Testings Studies have been requested by New York. The testing involves six different models: two blends - B&H and Natural Blend C; Regular and Menthol; and full flavor and lights. Initial cigarette models have been produced and are in analytical.

C. Plans:

Ad/Pack Cigarettes Produced	10/88
Blend and flavor work	On-going
Test Market	1st Qtr.'89

VII. Marlboro Blend Reformation

A. Objectives: To remove off shore tobacco from Marlboro blend.

B. Status: Phase X run was produced at Stockton Street in early September. This incorporated blends 10-1A, 10-1B, 10-1C, 10-1D, and a control. The control was judged to smoke too smooth compared to the tests. The analyticals for all samples were on target but the decision was made to cancel this Phase and re-make in early October. Phase XI is scheduled for the week of 10/4 with blend types 11 and 11-1.

C. Plans:

Phase XI	10/88

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 2305
PROJECT TITLE: Flavor Development-Brand Modification-Menthol/Distinctive
PROJECT LEADER: H. M. Maxwell
PERIOD COVERED: September, 1988

I. ALTERNATIVE FLAVORS:

A. Objective: To identify and qualify alternative sources for flavoring materials.

B. Status: A memo qualifying an alternate vendor for block licorice was written. POL testing of another flavor alternative (Jonex) is in progrees. Cigarettes for a replicate test were remade, and are being evaluated.

C. Plans:

POL Results For Alternative Jonex (Merit 85)	October, 1988
Replicate POL Results	November, 1988

II. PROJECT MOOG:

A. Objective: To develop the expertise to produce cigarettes that are subjectively equivalent to Salem, Newport and Kool.

B. Status: K-type and S-type flavor optimization is in progress. Semi-works, small scale, cigarettes were evaluated for K-type. One model seems promising. Further evaluation is in progress. S-type models are being evaluated. A paired comparison POL, testing N-type cigarettes versus Newport is in testing.

C. Plans:

K and S-Type Flavor Development	October, 1988
N-type POL Results	November, 1988

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III. MENTHOL RELEASE COMPOUND:

A. Objective: To develop a mentholated charcoal-filtered cigarette utilizing a menthol release compound. Also, to apply menthol release technology to other areas.

B. Status: The Foam Bound Rod group is continuing to investigate problems of MGC application. Poly menthyl isopropenyl carbonate was extruded on the "DL" blend at the 10% level. Evaluation is in progress. Extrusion runs at lower inclusion rates are planned. Samples of the anethol/menthol release compound were requested for further product development studies.

Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 1708
PROJECT TITLE: Physical Chemistry and Process Monitoring
PROJECT LEADER: J. L. Banyasz
PERIOD COVERED: September, 1988

I. OPERATIONS SUPPORT (J. Crump and A. Closter, in collaboration with the Applied Technology Group)

A. Objective: Determine the effect of particle size distribution on dynamic viscosity changes that occur in PVA tipping adhesives.

B. Results: Particle size analyses have been performed at Case Western Reserve University on a tipping adhesive before and after a prolonged run at 60 RPM in the simulator. The data indicate a shift in average size as a result of machining as well as a shift to a bimodal distribution. These results are suggestive of a degradation process.

Testing of four tipping adhesives currently used in the MC suggests that for the three adhesives supplied by National a reduction in roller speed during idling significantly decreases the viscosity changes observed during idling. An adhesive supplied by Fuller behaved in an inconsistent manner showing no correlation with roller speed.

C. Plans: The roller speed study will be completed.

II. OPERATIONS SUPPORT (T. Van Auken, in collaboration with the Applied Technology Group)

A. Objective: Develop a rapid means of determining plasticizer in filter tow.

B. Results: It was shown that the apparent aging effect in plugs, as observed via IA, are caused by changes in moisture content. Maintaining the plugs at constant RH eliminates the problem.

III. LOW DENSITY RODS (S. Ganeriwala and S. Shelton)

A. Objective: Compare the compression properties of low density and control rods.

B. Results: Samples sprayed with low molecular weight pectin (30,000) showed a significantly lower strain-to-break as compared to those sprayed with a high molecular weight (100,000) pectin. It was also shown that samples sprayed with a hot (70°C) pectin solution were less stiff but had a high breaking strain as compared to those treated with room temperature pectin solutions.

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C Plans: The effect of degree of methylation will be determined.

Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 8101
PROJECT TITLE: Cigarette Testing Services Division
SECTION LEADER: Joyce F. Stargardt
PERIOD COVERED: September, 1988

I. MARKET ACTIVITY

A. Objective: To monitor and report new brand introductions and brand modifications for the domestic and international cigarette markets.

B. Results:

1. CAMPAIGN '88 CIGARETTES

The Bush and Dukakis all natural presidential campaign cigarettes made by Georgopulo & Co. were found to be the same. No reconstituted or expanded material was found in the blend; no added flavorings or humectants were found with the exception of low levels of glycerin. The cigarette paper contained phosphate as a burn additive.

II. ANALYTICAL METHODS DEVELOPMENT AND SUPPORT

A. Objective: To evaluate and recommend analytical methods and new technology in support of programs for R&D and Manufacturing.

B. Results:

1. FREON® IN CIGARETTE FILLER

Representative brands from the major cigarette manufacturers were tested for presence of Freon®. Cigarette filler as well as the microscopically separated expanded tobacco portion were tested. Freon® continues to be used in the filler in R J Reynolds, American, Lorillard and Liggett brands. Philip Morris and Brown & Williamson do not use Freon® in their brands.

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Source: https://www.industrydocuments.ucsf.edu/docs/kpfm0000

PROJECT NUMBER: 1730
PROJECT TITLE: Plant, Cell & Tissue Culture Research
PROJECT LEADER: I. L. Uydess
PERIOD COVERED: September, 1988

I. TOBACCO-IDENTICAL PRESERVATIVES

A. Objective: To develop procedures and to establish microbiological screens for the evaluation of new, nature-identical preservatives as replacements for and/or as adjuncts to propylparaben.

B. Status:

Phase I Screens:

The C-10 and C-12 fatty acid alcohols have been evaluated in the Phase I shake-flask assay using propylparaben and the C-10 and C-12 fatty acids as controls. Both decanol and dodecanol have been found to exhibit approximately the same antimicrobial activity as decanoic and dodecanoic (lauric) acids, totally inhibiting the growth of B. coagulans (PM-13) at levels between 50 and 100 μg/ml.

Benzoic acid and sodium benzoate were also tested in comparison to propylparaben and a decanoic acid control. Each of the benzoate compounds exhibited marginal antimicrobial activity at 100 - 250 μg/ml, producing a half-maximal inhibition of growth similar in effect to that of the 150 μg/ml paraben control. The 100 μg/ml decanoic acid control completely inhibited the growth of the target organism, PM-13.

Phase III Screens:

Preliminary trials were begun in 5-liter fermentors in support of the development of standard operating procedures for a Phase III, fermentor-based screen. Four liter aliquots of fresh, Park 500 SEL (line 2 evaporator feed tank) were incubated at 37°C at both high and low mixing (aeration) rates to encourage spoilage. The SEL in the low agitation (more anaerobic) fermentor spoiled at a faster rate than did the SEL in the higher agitation (aerobic) fermentor based upon an increase in pH, colony forming units (CFUs) and odor.

In support of this, a meeting was held with Tom Long, Laura Singletary and Cindy Rustin of Park 500 to discuss and plan a collaborative research effort in which a Park 500 model system would be constructed in the R&D labs to mimic the major physical parameters that exist surrounding the cleaner feed (CFT) and evaporator feed tanks (EFT) at Park 500. The model system would be used to help evaluate spoilage under a variety of experimental situations as well as to examine the efficacy of prospective preservatives in SEL under more realistic (process-like) conditions in the laboratory.

C. Conclusions: None to be reported at this time.

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PROJECT NUMBER: 4009
PROJECT TITLE: Smoke Studies
PROJECT LEADER: B. L. Goodman
PERIOD COVERED: September, 1988

PROJECT STUDIO

A. Objective: Develop subjectively acceptable cigarettes with reduced sidestream visibility.

B. Results: KS cigarettes with reduced sidestream visibility were made in 20 and 23 mm configurations for initial evaluation of blends, aftercuts and paper additives. The Trim IV blend originally developed for 17 mm circumference cigarettes was selected for further aftercut work. Visibility reductions were not as high as for 17 mm circumference cigarettes previously made with the special $CaCO_3$ paper from Kimberly-Clark with 4.5% succinate. Additional papers with higher levels of additives have been received. A modified paper with monoammonium phosphate and carboxymethyl cellulose in addition to the succinate was found to give fewer structural holes around the charline, where sidestream smoke can pour out (chimney holes).

Three other sample bobbins were received from K-C to determine the effect of variation in processing of chemical additive levels during production of paper. The target level of succinate (5%) at +/_ 15% had been applied by Kimberly-Clark for evaluation of mainstream deliveries and sidestream visibilities. Papers with succinate versus citrate and two different types of CMC were also requested and received. Cigarettes have been requested from Semiworks with the new papers.

Model making has been initiated for a cigarette giving maximum sidestream visibility reduction. In order to achieve that objective, a high level (35%) of $Mg(OH)_2$ paper from Ecusta will be used in combination with a slower burning blend, 100% expanded tobacco, or a double wrap. King size models have been requested for visibility measurements and subjective evaluation.

C. Plans: Evaluate cigarettes subjectively, analytically and for physical performance with two different levels of succinate, MAP and CMC on K-C's special $CaCO_3$ paper.

Initiate samples made with a matrix of paper additives on K-C's base sheet for optimum paper on 20 or 23 mm circumference cigarettes.

Determine maximum possible sidestream visibility reduction with Ecusta's $Mg(OH)_2$ paper.

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Plans: Test various flavor extracts for their specificity towards female CBs.

D. MICROCLIME STUDY

1. Objective: To determine the existence of microclimates within a warehouse and the effects of the microclimate on CB behavior.

   Results: Late summer temperatures (August-September) within the warehouse and inside the hogsheads were stable. As expected the temperature change inside the hogsheads was slower. CB counts were too low to determine any affect (6).

   Plans: Ongoing data collection.

E. MODIFIED ATMOSPHERES (MA)

1. Objective: Obtain APHIS approval for an Isolcell® modified atmosphere.

   Results: Data for APHIS approval of a modified atmosphere have been generated and documented in a special report (7).

   Plans: Use available data to obtain APHIS approval for Isolcell®. Continue to investigate MA and CB mortality with special interest on the controls.

F. SERVICE TO OTHERS

1. Objective: To conduct trials and provide technical services to areas outside R&D.

   Results: Advised PM Australia on Cypermethrin® use (8) and assisted with phosphine fumigation at Commerce Rd. and Maury St. warehouses (9).

G. REFERENCES:

1. Ryan, L. Memo to H. Ganteaume. Methoprene Residues. September 1, 1988.

2. Lehman, R. Notebook No. 8519, pp. 97-98.

3. Drew, S. Notebook No. 7850, pp. 200.

4. Ryan, L. Letter to B. Harris. September 14, 1988.

5. Minor, M. Notebook No. 8539, pp. 53, 55.

6. Minor, M. Computer, RS1 File: Augtab. September 12, 1988.

7. Drew, S. Data and Analyses to Obtain APHIS Approval for Isolcell® Controlled Atmosphere Fumigations. September 16, 1988. Special Report (in review).

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PROJECT NUMBER: 6505
PROJECT TITLE: Special Investigations/Methods Development
PROJECT LEADER: D. F. Ingraham
WRITTEN BY: P. F. Grantham
PERIOD COVERED: September, 1988

I. PROJECT ART

A. Objective: Provide analytical support to project ART.

B. Results: Filler samples from the Bermuda Pilot Plant were analyzed for nicotine content for one week during vacation of Bermuda laboratory personnel. Two samples of wipe test pads from the Bermuda Pilot Plant were also analyzed for nicotine.

C. Plans: Continue analytical support on an as needed basis.

II. ANALYSIS OF RESIDUAL SOLVENTS IN PACKAGING MATERIAL

A. Objective: To provide headspace analyses for residual solvents from packaging materials and develop a QA method for the routine analysis of packaging materials.

B. Results:

The routine headspace analysis has been turned over to QA. Thus far, two sets of data for comparison have been generated. In general there was good agreement. During the past month, several dozen new packaging materials and inks have been analyzed using the headspace GC method.

Several printing and packaging vendors have expressed interest in visiting PM to observe our procedures. The visits will be set up at our convenience.

C. Plans: Continue the comparison between R&D and QA until we are comfortable with the levels of agreement. Continue analyzing new packaging materials. Assist in aquainting vendors with our GC/headspace methods.

III. MATERIALS EVALUATION

A. Objective: To identify components of commercial products prior to their use at PM facilities.

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B. Results:

Samples this month included glues, vacuum hose, conveyor belting and several foreign matter samples. Recommendations were made for all samples.

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3. We will have both the current (Danforth) flax fibers and the regenerated cigarette paper fibers characterized at the University of Maine laboratories so that reasonable raw material specifications can be established.

4. We will process conventional cigarette paper at Philip Morris to produce a regenerated flax stock containing "shive" fibers. This stock will be used for the preparation of handsheets to demonstrate the ability to produce less porous paper. If successful, such regenerated stock may be used on the University of Maine paper machine to prepare a less porous cigarette paper.

D. References:

1. Baldwin, S. D., R. M. Rogers and G. H. Bokelman, memo to R. N. Ferguson, "Preparation of Cigarette Paper on Pilot-Scale Paper Machine," September 22, 1988.

2. Rogers, R. M., Internal Ecusta Corporation Study, June, 1981.

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PROJECT NUMBER: 2108
PROJECT TITLE: New Product Technology
PROJECT LEADER: W. T. Callaham
PERIOD COVERED: September, 1988

I. PROJECT SAUNA

A. Objective: Develop an acceptable product with a modified fluted plastic filter.

B. Status: Cigarettes with 50% and 60% constant dilution (flutes occluded) were remade at lower tobacco weights and evaluated by EEMA personnel. Both models were subjectively acceptable, however, the 50% model was preferred. The ISO tar deliveries were slightly above the target of 10 mg as shown below:

FRONT BAND DILUTION,%	50	60	60
TOBACCO WEIGHT, mg	650	630	650
ISO TAR, mg	11.4	10.9	10.0

Additionally, a substantial amount of sidestream smoke due to back pressure was noted coming from the front band dilution holes.

C. Plans: A meeting was held with EEMA personnel to discuss changes in cigarette design in order to further reduce tar values and eliminate the back flow of smoke. These design changes will include the use of electrostatically perforated cigarette paper, reduced front band dilution, and/or faster cigarette paper. Also, several tippings with different adhesives will be evaluated for improved bonding to the fluted filter.

II. HUMIDOR PACK

A. Objective: Develop a moisture release device for use in a cigarette pack which maintains the pack OV at a desired level.

B. Status: A second production run of Humidor packets was made at Klockner Packaging with different foil laminate materials. As in the first production run, leaking seams and curling packets were encountered. Consequently, discussions were held with Celanese regarding improvements to the Celgard film material and with PPG Industries regarding their Teslin film material. A confidentiality agreement is being pursued with PPG. Celanese attempted to make packets for us in their lab and encountered similar problems as at Klockner.

One of the stiffer foil laminate backings which did not work with Celgard was used successfully with cellulose triacetate (CTA) film in the lab. CTA film has been shown in the past to perform similarly to Celgard, therefore, further investigation of these two materials together will be conducted.

The development cigarette packer that Engineering has been working on has been relocated to the OC basement. Hand-made packets are

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PROJECT NUMBER: 1806
PROJECT TITLE: New Tobacco Processes
SECTION LEADER: S. R. Wagoner
PERIOD COVERED: September, 1988

I. PROJECT ART - PILOT PLANT SUPPORT

A. Objective: To provide processes for converting and casing stem materials for the Bermuda Hundred Pilot Plant.

B. Results: Batches of Louisville CRS (cut at 53 and 150 cpi) and D Pilot Plant CRS (cut at 90 and 150 cpi) were cased with monopotassium citrate and shipped to the Bermuda Hundred Pilot Plant. This allowed the BHPP to conduct a series of tests to determine the effect of cut width on adsorber pressure drop.

C. Plans: Continue to produce stem products as required by Project ART.

II. PROJECT ART - COMMERCIAL PROCESS DEVELOPMENT

A. Objective: To conduct trials providing information for development of the ART commercial process.

B. Results: A program was initiated to reduce the spotting of cigarettes by ART filler. An accelerated laboratory spotting test was qualitatively correlated with actual cigarette spotting audit data. It was determined that the unextracted DL blend (uncased, cased, and cased plus aftercut) does not have the tendency to cause spots that the extracted filler has. Current efforts are devoted to examination of the wax layer produced by hot versus cold recovery, and the remaining non-wax filler from those same runs. In addition, post-ART tobacco treatments, such as the Hauni steam tunnel, will be evaluated for potential to reduce cigarette spots.

Laboratory experiments were conducted to determine if residual ammonia in extracted filler could be reduced through reaction with sugars. The experimental grid consisted of filler moisture level (20 and 30% OV), temperature (60 and 80C), and reaction time (2 and 5 hours). The experiment showed that while temperature and time are controlling factors, times greater than 2 hours are required to significantly reduce the soluble ammonia level. This conclusion was reinforced by a pilot plant trial in which post-ART filler was cased with fructose, superheated in the Hauni WD tunnel, and dried in the Hambro dryer. The chemical results showed no significant reduction in soluble ammonia for the treated filler compared to the starting material.

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The ART process computer model was used to indicate the levels of alternate bases required to replace one-half of the 3.0% AB casing target. This showed that the necessary addition levels of citrate

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PROJECT NUMBER: 1704
PROJECT TITLE: Supercritical Fluid Processes
PROJECT LEADER: T. M. Howell
PERIOD COVERED: September, 1988

I. LOW NICOTINE

A. Objective: Bermuda Hundred Pilot

B. Results: Laboratory extractions were performed on DLIII blend and compared with extraction data from DLI and DLII. Results indicate that DLIII is similar to DLII in extraction with equivalent amounts of AB added. Initial nicotine concentration in CO_2 over blends II and III is somewhat higher than over blend I. Final nicotine concentrations over blends II and III drop below blend I at the end of the extraction even though the extraction levels are the same. Data indicate that blend I moderates changes in acid-base concentration better than blends II and III. Components, including bodied bright, thin bright, bodied burley and thin burley, of blend III were extracted, but a comparison with the DLI components could not be made because of limited data at the present extraction conditions. It was noted that the newest bodied bright had a lower nicotine concentration than the DLI bright.

C. Plans: Continue obtaining extraction data on the blends and blend components in order to develop a data base for future comparisons and to provide information needed to further the basic understanding of the ART process.

II. LOW NICOTINE

A. Objective: Understand solubility behavior of tobacco wax solubles in SC-CO_2.

B. Results: An apparatus for studying the behavior of waxes in supercritical CO_2 at constant temperature and solubles-to-CO_2 ratio while varying pressure has been designed and fabrication is underway. This unit may provide information about saturation conditions of these constituents.

C. Plans: This work is ongoing.

III. LOW NICOTINE

A. Objective: Develop alternate on-line nicotine monitors for the ART process.

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B. Results: A shorter path-length cell for the CD instrument has been located and ordered. Further work with the instrument is limited to verification with manual sampling techniques until the cell is received and installed.

C. Plans: This work is ongoing.

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PROJECT NUMBER: 2525
PROJECT TITLE: Tobacco Chemistry
PROJECT LEADER: R. R. Izac
PERIOD COVERED: September, 1988

I. NATURAL PRODUCTS CHEMISTRY

A. Objective: To isolate, identify and/or analyze natural compounds with major emphasis on tobacco and tobacco products.

B. Results: 1. A sample of nicotine was isolated from flavor pellets and purified for T. Sanders. 2. A sample of cigarette paper, which contained spots, and a sample of Art filler was analyzed for solanesol by TLC and NMR (R. Bassfield) for T. Sanders. Dichloromethane extracts of both samples looked identical, containing solanesol and other tobacco components. Nicotine was not observed in these extracts.

C. References:
1. Izac, R. Notebook No. 8632.
2. Core, M. Notebook No. 8608.

II. LOW NICOTINE

A. Objective: To examine characteristics of unextracted nicotine.

B. Results:
1. Grafted tobacco on a tomato rootstock appears to contain only extractable nicotine. A group of tobacco on tomato and tomato on tobacco grafts have been completed.

C. Plans: Continue to investigate genetic and cultural factors which influence the amount of unextracted nicotine in tobacco materials.

D. References:
1. Izac, R. Notebook No. 8632.
2. Bass, R. Notebook No. 8607.
3. West, G. Notebook No. 8559.

III. GREENHOUSE STUDIES

A. Objective: To maintain the R&D greenhouses, to conduct plant research studies and to provide greenhouse-grown tobacco materials for support of other R&D programs.

B. Results: The harvest of roots from Group 14 of the hydroponic Burley 21 plants has been completed and about 16kg of fresh root material was supplied. During the harvest of Group 14, one plant was selected for Chloride analysis to determine if the chloride content varies from one area to another within a leaf. The hydroponic culture equipment was set up and 52 plants of Burley 21

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PROJECT NUMBER: 6908
PROJECT TITLE: Smoke Condensate Studies
PROJECT LEADER: A. H. Warfield
PERIOD COVERED: September, 1988

I. TSNA PRECURSORS

A. Objective: To determine the precursors of MS TSNA.

B. Results: Nicotine bitartrate (NBT), a potential candidate for microencapsulation and subsequent use as a model of unextracted nicotine, was synthesized in crystalline form by J. Paine. In order to prepare the crystals for microencapsulation, it was necessary to reduce the particle size to 90-150μ. X-ray microscopy (K. Sanders) revealed that the NBT crystals were thin rectangular platelets 4-40μ X <1μ thick, which were agglomerated into larger particles. These particles would not pass through a 150μ screen. Grinding in a mortar and pestle did not appreciably reduce the particle size.

Ascorbic acid (ASC) was applied to an RL made from a mixture of burley (Bu) and oriental (Or) CEL's on Bu base web (BW), and cigarettes prepared from this RL were smoked for TSNA determination. Blending Or and Bu CEL's produces a significant reduction in MS TSNA relative to that obtained from the same amount of BuCEL on BuBW, as shown earlier. The TSNA reduction was further increased by addition of ASC. Blending ASC into the mixed CEL's before addition to the BW was not as effective as overspraying the ASC onto the prepared RL. Previous studies indicate that ASC acts largely by increasing decomposition of endogenous TSNA. Therefore, these results suggest that OrCEL acts largely on the pyrosynthetic mechanism of TSNA formation.

D. Plans: Attempt to grind the NBT in a mill capable of operating at liquid nitrogen temperatures. When correctly sized particles are obtained, submit samples for microencapsulation, and add to appropriate fillers. Determine the effect on MS TSNA deliveries. Evaluate results of FTIR-EGA investigation of the effect of added OrCEL on nitrogen-containing compounds. Also, plans are being made to study OrCEL fractions in order to identify the active component(s).

E. References:

Haut, S. A. Notebook 8595, pp. 154-155.
Morgan, W. R. Notebook 8579, pp. 67-68.
Sanders, K. Notebook No. 8612, pp. 166, 178.

II. TSNA DECOMPOSITION STUDIES

A. Objective: To explore the thermal stability of TSNA and investigate methods to enhance thermally induced decompositions of these compounds.

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were made of a waxy substance. Glass-like fibers were found on the outer surface. Dilution holes were within a 2mm wide area around the filter and had a total area of dilution holes at 0.52 mm^2 and a mean hole area of 0.002 mm^2.

The rod paper appeared to be similar for both cigarettes. The paper contained flax fibers and standard $CaCO_3$ as well as a smaller size of $CaCO_3$ at 0.3 μm to 0.03 μm in diameter. No other additives were detected using EDS. However, by using light microscopy, dark specks could be seen scattered throughout the paper[1].

Examination of Metal Fragments from ART Vessel and Basket: Scrapings from the wall of the ART vessel and from the basket used in the ART vessel were found to contain metal fragments and stem pieces. The main elements found in the metal scrapings from the basket were Fe, Cr, Pb, and Cu. There were two distinctive shapes of metal fragments, one was a round glob shape while the other was a rectangular shape. These fragments were not homogeneous. They contained several discrete areas of different metals.

Elements found in the fragments from the ART vessel wall were Ni, Fe, K, S, and Si. Again the fragments were not homogeneous.

Stem pieces associated with the metal fragments contained K, Ca and Cl as well as Fe, Cu, Si, Cr, Ni, and Zn [2].

Examination of U-Shaped Metal Part from ART Vessel: Striations were seen throughout the length of the metal. Fractures were more prevalent at the edge of the metal than toward the center of the piece. There appeared to be an outer layer of metal that coated the part. A roughness at the rounded end of the metal part appeared to be created by the separation of this coating layer from the underlying layer. There also were more fractures on the curved end of the piece[3].

Examination of Nicotine Bitartrate Dihydrate: Three samples of synthesized nicotine bitartrate dihydrate were examined to determine their size and structure. Two samples were sieved and one was not. All samples contained thin wafer-like structures of different sizes. All three samples contained particles in the size range of 1 μm to 44 μm in length[4].

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C. References:

1. Baliga, V., Sanders, K., and Henry, B., "Structural and Elemental Characterization of Regular and Thin Cartier Cigarettes," Memo to B. Handy, August 31, 1988.
2. Baliga, V., Sanders, K., "Metal Fragments from ART Baskets and ART Vessel Walls," Memo to D. Watson, September 14, 1988.
3. Sanders, K., "Analytical Microscopy Result Form," to B. Laroy, September 9, 1988.
4. Sanders, K., "Analytical Microscopy Result Form," to S. Haut, September 20, 1988.

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PROJECT NUMBER: 6906
PROJECT TITLE: Biological Effects of Smoke
PROJECT LEADER: J. M. Penn
WRITTEN BY: L. H. Thompson and G. J. Patskan
PERIOD COVERED: September, 1988

I. INHIBITION OF EGF BINDING ASSAY

A. Objective: Determine the role of protein kinase C in CSC induced inhibition of EGF binding using protein kinase C inhibitors.

B. Results: To establish the optimal conditions for experiments with CSC, the effects of H-7 (a protein kinase C active site inhibitor) on the response to TPA and PDBu binding were determined. EGF binding was inhibited following a thirty minute exposure to TPA (100 nM) or PDBu (500 nM). H-7 (100 uM) had no effect on the response to TPA or PDBu.

C. Plans: Evaluate the effects of W-7, a protein kinase C inhibitor which acts at the the phorbol ester binding site, on the inhibition of EGF binding by TPA and PDBu.

D. Reference: Patskan, G. Notebook No. 8710, p. 1.

II. NICOTINE SPECIFIC MONOCLONAL ANTIBODY

A. Objective: To obtain a monoclonal antibody (MCA) against nicotine (NIC-MCA).

B. Results: The contract lab reported that the preparation and analysis of immune sera from mice injected with nicotine conjugated antigen has been completed. The results from an ELISA assay indicate that successful immunization has occurred. Those sera dilutions are being sent to PM for further analysis.

C. Plans: Examine the sera dilutions from the contract lab in an ELISA assay here at PM and determine the titers of all sera.

D. Reference: Davies, B. D. Notebook No. 8638, p. 70.

III. APPROACHES TOWARD PUTRESCINE METHYLTRANSFERASE (PMT) ISOLATION

A. Objective: Provide additional experimental approaches to assist in the effort to isolate PMT.

B. Results: A non-homogeneous preparation of phenethanolamine-N-methyl transferase (PET), an enzyme related to PMT, was subjected to SDS-PAGE (sodium dodecyl sulfate - polyacrylamide gel electrophoresis) and transferred to nitrocellulose. Immunostaining of the nitrocellulose with an antibody against PET (APET) revealed a specific band of ~29,000 MW. When PMT Prep I fractions were analyzed by the same procedure, nonspecific staining of all

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PROJECT NUMBER: 1620
PROJECT TITLE: Electrophysiological Studies
PROJECT LEADER: F. P. Gullotta
WRITTEN BY: C. S. Hayes
PERIOD COVERED: September, 1988

I. NASAL EVENT-RELATED POTENTIALS (NERPs)

A. Objective: To develop methods to objectively and reliably evaluate human responses to cigarettes, smoke constituents and tobacco flavorants.

B. Results:

Cognitive NERP Study

Cognitive NERP experiments comparing natural and synthetic menthol have been initiated in ten subjects with the goal of determining whether subjects can differentiate between the menthols. Employing synthetic menthol as the standard stimulus and natural menthol as the target stimulus, nine subjects have been tested to date.[1] Both the NERP and the psychophysical data demonstrate that subjects are able to discriminate between the two different menthols. A late positive component (LPC) is being recorded to the natural menthol targets that is not apparent in the synthetic standards. Interestingly, for most of the subjects, their actual performance is much better than their perceived performance.

Quantification of the NERP data from the natural menthol vs CO_2 comparison continues. Preliminininary analyses of the data were not very informative due to noise in the data. The data have been filtered and are in the process of being reanalyzed.

C. Plans: Complete testing of ten subjects in the cognitive paradigm comparing natural and synthetic menthol. Complete statistical analyses of the data from the CO_2 vs. natural menthol comparison and begin analysing the natural vs. synthetic menthol data. Further plans include the testing of mixtures of natural and synthetic menthol, d-menthol, (+)-isomenthol and other yet-to-be determined menthol-like compounds.

D. Reference:

1. Martin, B. R. Notebook No. 8689, pp. 32-84.

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III. BASIS (G. Davis & J. Lawson)

A. Objective: Provide back-up for Alice Lewis in Basis database design and support. Continue to support Engineering Department Central File in database usage.

B. Results: Specification database created last month and put in test environment has been accepted without change.

C. Plans: To remain accessible to the basis users. To move Central File's databases from rmnt2 to usr/hd/smaugh7.

IV. SOFTWARE: (G. Davis & J. Lawson)

A. Objective: Evaluate new software as needed such as Interleaf, Centrum, Alice, Fultext, ProChart, Profs.

B. Results: Evaluation of the graphics and equation editor within Centrum is in progress. A comparison is being made between these two products within Centrum for ease of use and functionality as compared to creating the same information in Interleaf. The currently loaded version of ProChart is still not the version we presently have documentation for.

C. Plans: Support any of the above products as they become production. Evaluate software as it becomes available on the system.

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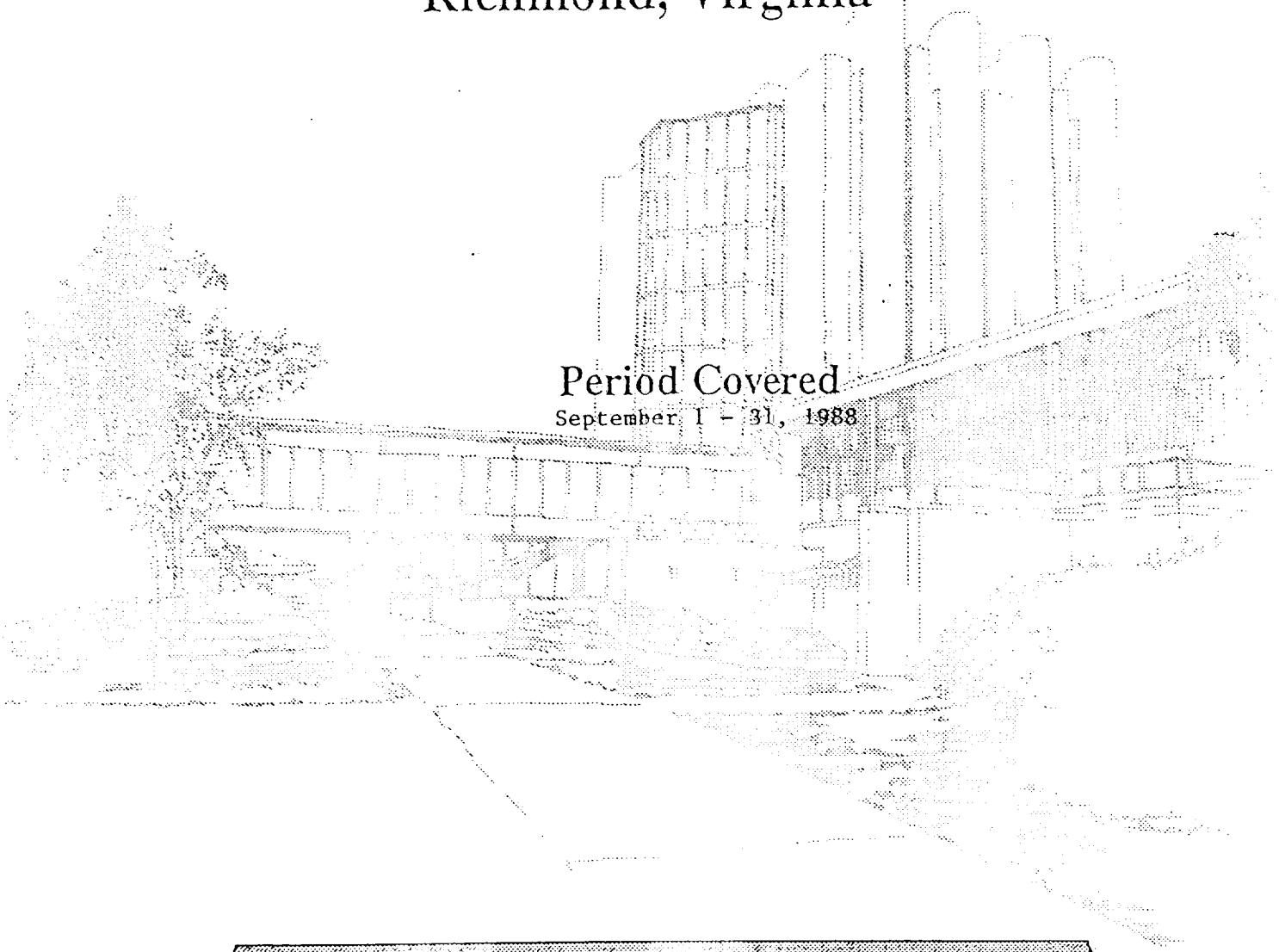

Period Covered
September 1 - 31, 1988

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PROJECT NUMBER: 0008
PROJECT TITLE: Computer Applications
PROJECT LEADER: G. Davis
PERIOD COVERED: Aug. 19 - Sept. 19, 1988

I. COMPOSER/UNIX TRAINING (G. Davis & J. Lawson)

A. Objective: Provide training and support for Unix and WMC text processing package. Conduct training, user support and implementation of software revisions as they become available. Design WMC customized templates for the R&D Community. Maintain consistency of WMC menus and configuration files across all systems.

B. Results: Developed and held a "Sun Window Environment" class for AutoCad personnel. Two Unix classes were held. A final WMC class was held for professionals during the month. Started an electronic weekly message tip on WMC and Unix for all secretarial personnel. Spent time preparing new PM templates to be released next month. Programmed the function keys on Sheryl Baldwin's MacIntosh for WMC. Supported the general user questions during the month.

C. Plans: Composer+ has been loaded on PM03 and will be evaluated as time permits.

II. FULTEXT/SCANNER: (G. Davis)

A. Objective: Become familiar with the Fultext product and the Palantir scanner targeted for Central File to decrease the paper backlog in R&D's warehouse of an estimated 10 million pages. Implement and support for the above two products. Become familiar with Paint product for enhancing scanned images with the Palantir scanner.

B. Results: An additional 119 pages of CCTS have been scanned, edited and forwared to Maggie Southwick by the COE student. Additional images were scanned and edited for Daryl's Faustini's book as requested. They were sent electronically to Trish Sinkiewicz. Problems have been encountered with Bernie Laroy's Fultext collection with WMC as the default editor. Screens have been modified for the newspaper clipping file and work has begun on documentation of the process for the Library staff. A filter will be written to pull profile data from the scanned information and the off-site keyed data. Instructed Jean during the month on the use of the Palantir scanner for images and text.

C. Plans: Continue support on above. Continue learning about Fultext in regards to customization. Work will continue by the COE student on scanning and editing the CCTS data.

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PROJECT NUMBER: 1101
PROJECT TITLE: Entomological Research
PROJECT LEADER: D. L. Faustini
WRITTEN BY: S. Drew
PERIOD COVERED: September, 1988

I. PHYSIOLOGICAL STUDIES OF THE CIGARETTE BEETLE (CB)

A. METHOPRENE

1. Objective: To determine the most efficient use of the insect growth regulator (methoprene) within PM's CB control program.

   Results: Reported on methoprene residues of Colombian cigarettes (1).

2. Objective: Bioassay stems and stem scraps to determine the optimum treatment levels and storage time.

   Results: Obtained AESS bright stems and initiated base line bioassays (2).

   Plans: Treat with methoprene and initiate treated bioassays.

3. Objective: Determine the sensitivity of the methoprene analysis conducted by Universal Leaf Tobacco (ULT).

   Results: Methoprene was detected on only one the two methoprene treated samples. Sample J8CC was treated at 5.0 ppm, but only 4.3 ppm was detected. No methoprene was detected on sample E33K (concentration unknown)(3).

   Plans: Submit more samples with methoprene concentrations between 1.0 and 5.0 ppm.

B. GLOBAL ECOLOGY

1. Objective: To determine the distribution and abundance of the CB as it relates to the processing of tobacco into cigarettes.

   Results: Visited flue-cured stabilization warehouses to assess on-going monitoring program (4).

C. FLAVOR EXTRACT STUDY

1. Objective: To determine the attraction of certain flavor extracts to female adult cigarette beetles (CB).

   Results: A 5.7% bright tobacco extract attracted 40 percent more mixed-sex CBs than the control (water extract) (5). This indicates that the olfactometer instrument is working satisfactorily.

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PROJECT NUMBER: 2501
PROJECT TITLE: Smoke Chemistry
PROJECT LEADER: R. Comes
PERIOD COVERED: September 1988

I. SIDESTREAM SMOKE

A. Objective: Conduct studies on sidestream smoke including: development of methods for collection and analysis of sidestream gas phase and semivolatiles; visibility determinations; analysis of selected materials relating to sidestream odor and irritation; development of potential proprietary products.

B. Status: (1) The development of satisfactory procedures for analysis of sidestream gas phase components continues. (2) Visibility determinations have been conducted on various cigarette types. Studies utilizing the apparatus being developed for CORESTA sidestream measurements have been carried out independently and in conjunction with visibility measurements. (3) Modifications continue in an attempt to design a "CORESTA" apparatus for sidestream determinations. (4) A study to compare the quartz halogen lamp with a green HeNe laser as light sources was carried out on the 5-port visibility apparatus. Construction of an 8-port apparatus continues. (5) Initial efforts in anticipation of SS chamber construction approval have continued.

C. Results: (1) Compounds from sidestream smoke ranging in volatility from propane to beyond nicotine have been observed using the Tekmar gas phase method. A plateau has been reached in the identification of new materials in this "unconventional" gas phase. To address this problem, a heart cutting system has been installed and is currently under investigation. A recurring problem in the Tekmar system is plugging of liquid nitrogen cold traps with water or large amounts of major components. This limits the sample size and thus the capability for detection of ultra-trace components that may be important flavor compounds. (2) Visibility data was generated on the 17-port apparatus on a series of reconstituted tobacco sheets with varied humectant types and levels. No significant differences were observed between any of the models regardless of type or level of added humectant. Cigarettes prepared in the reduced density rod program were evaluated on the CORESTA apparatus and on the 17-port visibility system. The data showed that, as expected, reducing the amount of filler reduces the TPM, DPM, nicotine and tar for both MS and SS, other parameters being equal. However, on a mg/g of tobacco consumed or on a per puff basis, the opposite trend is observed. 17-port visibility measurements (determined over only a portion of the total static burn time) support this trend in that the low density rod cigarette demonstrates higher visibility than the normal weight control. (3) A prototype of a "new" SS collection chamber has been designed and constructed. It has been dubbed "Enclosed Fishtail (EF)" or "Enclosed Chamber (EC)" and is designed to be used with an electric cigarette lighter and to accomodate 100mm cigarettes. IR4F cigarettes have been smoked using this chamber to examine the effects of varied flow rates on SSTPM, SS moisture and SS nicotine. (4) The study to

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PROJECT NUMBER: 1702
PROJECT TITLE: Optical Processing and Aerosol Research
PROJECT LEADER: K. A. Cox
PERIOD COVERED: September, 1988

I. DIGITAL PACK INSPECTION

A. Objective: Develop and implement a method for digital pack inspection.

B. Results: Our digital approach to pack inspection now looks very promising. Numerical simulations (which, although carried out at a reduced speed, yield results identical to those one would obtain on an actual inspection system) have shown the method to be capable of high resolution inspection even when trained on only acceptable packs. The method was evaluated on our video library of approximately 1600 packs, containing examples of poor label registration, missing closure stamps and misplaced closure stamps. All packs were correctly classified as either acceptable or unacceptable. An invention record has been filed. Efforts are now underway to implement the inspection scheme on the Nu Vision system available from Perceptics. The system is expected to achieve inspection rates exceeding 6 per second.

C. Plans: Implement the inspection scheme on the Perceptics vision system. Develop a new set of samples of both acceptable and unacceptable packs in order to allow a thorough evaluation of the system's capabilities.

II. INDIVIDUAL CIGARETTE INSPECTION (D. Lowitz)

A. Objective: Develop methods for the online inspection of individual cigarettes.

B. Results: Two primary scanning methods are being considered for the finished cigarette inspection system. The first utilizes an acousto-optic cell to repeatedly direct a laser beam up and down the length of the cigarette as it is rotated. A novel technique was conceived for converting the lengthwise scans to circumferential scans by incorporating an additional AO cell. This may yield an improved signal to noise ratio. The second scanning method utilizes a linear CCD array along with the same rolling mechanism. Brimose Corporation has agreed to provide a detailed proposal for the first system while the capabilities and design of the second system is being pursued with EG & G Reticon.

C. Plans: Implement the better scanning technique in the laboratory. Create an image library for the development and testing of inspection algorithms.

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PROJECT NUMBER: 1752
PROJECT TITLE: Optical Spectroscopy of Tobacco and Smoke
PROJECT LEADER: J. O. Lephardt
WRITTEN BY: N. J. Jensen
PERIOD COVERED: September, 1988

I. TANDEM MASS SPECTROMETER

A. Objective: To establish a mass spectrometry center with state of the art capability in tandem, high resolution, and soft ionization mass spectrometry.

B. Results: Paperwork has been completed and a purchase order processed for acquisition of the JEOL SX102/SX102 four sector tandem mass spectrometer. The vendor is in the process of constructing the instrument.

C. Conclusions: The instrument should be installed and operational next summer.

D. Plans: Instrument construction is the responsibility of JEOL. Activities continue with regard to preparation of laboratory facilities to house the new instrument and acquisition of chromatography accessories.

II. PYROLYSIS MS

A. Objective: To characterize residues obtained from the ART reactor vessel.

B. Results: Two samples designated as vessel wall material and basket material were analyzed by pyrolysis on the thermal chromatography - mass spectrometry (TC-MS) unit. Both samples were pyrolyzed in three temperature ranges (30°C to 130°C, 30°C to 250°C, and 30°C to 400°C). The gases evolved in each of these ranges were chromatographed on a DB-5, 0.25 micron phase, 30 meter column.

C. Conclusions: Data review is in progress.

D. Plans: A report on results will be prepared.

III. EGA ANALYSIS

A. Objective: To examine interaction effects from cross baseweb materials.

B. Results: Burley, Bright, and Oriental extracts have been examined on Burley base web under a nitrogen atmosphere and under a 7.5% oxygen in nitrogen atmosphere.

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1. Ayers D.J. Notebook No. 8210, pp. 161-166.

2. Ayers, D.J. Project 1902 Monthly Summary. PM Redbook Accession Number 88-052; 1988 August 15.

3. Gaines, O. Notebook No. 8690, pp. 27-36, 38-42.

III. BACTOMETER CALIBRATION CURVES

A. Objective: To generate calibration curves for determining the number of bacteria present in a sample using the Bactometer.

B. Status: Data (bacterial counts and detection times) have been collected from five sampling periods each of Bright, Burley, and Oriental Tobacco, and RLTC, RL150B, and a Marlboro Blend material. The data have been submitted to J. Tindall for statistical analyses.

C. Plans: Further efforts in this area await analysis by J. Tindall.

D. Reference:

1. Chadick, D. Notebook No. 8625, pp. 96-98, 101-102, 104-107, 110-111, 113-114, 116-119, 125-132, 139-140, 143-144.

IV. BACTOMETER ORIENTAL EXTRACT STUDY

A. Objective: To determine if concentrated Oriental tobacco extract contains antimicrobial factors that are affecting Bactometer detection times (1).

B. Results: In addition to the previously mentioned experiments (2), three experiments were conducted to determine the effect of a concentrated Oriental extract (100x) on the growth of B. pumilus. The detection times were longer from the culture diluted in the Oriental extract when compared to the times obtained from the same culture diluted in saline. These new results agreed favorably with the previously reported results (2,3).

C. Plans: A memo will be issued.

D. References:

1. Jones, J. Notebook No. 8590, pp. 70-71.

2. Ayers, D. Project 1902 Monthly Summary. PM Redbook Accession Number 88-052; 1988 August 15.

3. Jones, J. Notebook No. 8590, pp. 66, 69-72, 76.

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were transplanted for Group 15. These plants are being grown for Project 1904.

A total of 10 plant grafts were made using Burley 21 as the rootstock and N. glutinosa as the scion. The purpose of this is to provide a plant which boosts the production of nornicotine.

The greenhouse maintenance operations including seeding, transplanting, nutrient solution preparation and other cultural tasks were completed.

The experimental flue-cured and Oriental tobacco grown at Whiteville Research Station have been harvested and are being cured.

C. Plans: Maintain production of fresh root tissue by hydroponic culture. Monitor the field plots as needed.

D. References:
1. Bass, R. Notebook No. 8607.
2. West, G. Notebook No. 8559.

IV. SUPPORT ACTIVITIES

A. Objective: To provide requested assistance for special projects.

B. Results: 1. About five pounds of poly(1-menthol-isopropenylcarbonate) (CR# 1417) was cleaned up. 2. The Georgia Tobacco Variety Evaluation Display was attended at Hahird, GA., and, in cooperation with Leaf Department, tobacco samples were evaluated. 3. A sample of pentylated cyclodextran was purified for H. Secor.

C. Plans: Analysis of the CR# 1417 for purity is in progress.

D. References:
1. Izac, R. Notebook No. 8632.
2. Bass, R. Notebook No. 8607.

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^{3}H-SAM labeling of PMT preparations has been conducted by Dr. Bruce Davies.

C. Plans: Continue to optimize affinity matrix for purification of PMT. Continue to optimize native gel (Canalco) system to purify PMT. Continue ^{3}H-SAM labeling studies. Obtain PMT-active samples for application to affinity and native gel.

D. References:

1. Dunn, R. L. Notebook No. 7899.
2. Malik, V. Notebook No. 8542.
3. Davies, S. Notebook No. 8694.
4. Yu, T. Notebook No. 8381.
5. Mooz, E. D. Notebook No. 8599.
6. Crockett, E. Notebook No. 8563.

II. ALTERNATE HUMECTANTS (PG/G-FREE SHEETS/CIGARETTES) (1)

A. Objective: To produce an acceptable cigarette (domestic Marlboro-type) which is PG/G-free by the end of 1988.

B. Results: Zero-time survivability tests on production plant PG/G-free RCB were conducted in the make-pack processing area. Samples have been submitted for analytical evaluation. Subjective evaluation of the first PG/G-free cigarette model and a control cigarette was performed by the Flavor Development panel and the cigarettes were found to be similar (2).

C. Plans: Another PG/G-free cigarette model will be made and evaluated by Flavor Development (3).

D. References:

1. Mooz, E. D. Notebook No. 8599.

2. Ruziak, S. PG/G-free Marlboro KS Small Scale Run. Memo to E. Mooz; 1988 September 14.

3. Ruziak, S. Personal Communication to E. Mooz. 1988 September 14.

III. ALTERNATE HUMECTANTS (GLYCERINE-FREE SHEET/CIGARETTES) (1)

A. Objective: To produce an acceptable glycerine-free (G-free) cigarette (domestic Marlboro-type) for a POL test by the end of the first quarter of 1989.

B. Results: Control and G-free POL 3582 cigarettes that were remade in the Semi-works have been rejected due to differences in tar deliveries between the control and test cigarettes.

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PROJECT NUMBER: 2500
PROJECT TITLE: Fundamental Chemistry
PROJECT LEADER: J. I. Seeman
PERIOD COVERED: September 1988

I. FLAVOR/ODOR CHEMISTRY (Houminer, Paine, Seeman)

A. Objective: To develop new technologies for smoke deliveries of desired flavorants; to prepare new substances for flavor/odor evaluation; to develop methodologies for the analysis of subjective data.

B. Results and Plans: Plans for new smoke studies related to flavor release and MS/SS deliveries are being prepared. A number of series of substrates are being evaluated. A new constant temperature bath has been installed and some thermolyses of pyrazine ethanols are in progress.

One of the diastereomers of a tetramethylpyrazine (TMP): alcohol release agent has been purified. Initial preparation of a new series of TMP release agents is underway.

II. CHEMICAL PHYSICS STUDIES OF TOBACCO CONSTITUENTS (Secor, Seeman)

A. Objective: To obtain structural information about important tobacco constituents/flavorants; to develop information on cluster formation and chemical reactions in clusters.

B. Results and Plans: A number of substituted aromatics were prepared and sent to E. R. Bernstein. Reports have been completed on laser jet studies of alkyl, alkoxy, and allylbenzenes and drafts are in progress on other work.

III. REMOVAL OF NICOTINE FROM AQUEOUS TOBACCO PROCESSING FLUIDS (Hassam, Seeman)

A. Objective: To develop techniques to remove nicotine and other tobacco alkaloids from aqueous tobacco processing fluids to the exclusion of all other components.

B. Results and Plans: Studies with Sepracor continue. Preparations for the installation of a bench scale membrane system is in progress. Nicotine has now been successfully separated from a model aqueous scrubber liquid and concentrated by a factor of >14.

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IV. MISCELLANEOUS (Hassam, Secor)

Results and Plans: Studies continue on the development of TLC methods for TSNA analyses. A special report on [C-^{14} glycerol was issued. The preparation of polyalkylcyclodextrins for use as

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PROJECT NUMBER: 1720
PROJECT TITLE: Analytical Microscopy
PROJECT LEADER: V. L. Baliga
PERIOD COVERED: September, 1988

I. LOW SIDESTREAM CIGARETTE PAPERS (BALIGA, HENRY)

A. Objective: Examine the structure of cigarette papers and paper additives in support of the low sidestream project.

B. Results: Five handsheets were made for the low sidestream project and were examined for particle distribution on and within the paper. Sheets made with Multiflex MM $CaCO_3$ contained large clumps of Ca-containing filler material with more of the clumps on the wire side of the paper. The Multiflex MM $CaCO_3$ particles did not coat the fibers. Fibers from handsheets made with Omega fine $CaCO_3$ also were not coated with the additive. In contrast to the handsheets made with the Multiflex MM $CaCO_3$, the handsheet made with Omega fine $CaCO_3$ did not have large clumps of the additive. Two of the Multiflex MM containing handsheets contained carbon, one at 0.5% by wt. and one at 1% by wt. The carbon particles were evenly distributed across the sheet in both samples. As measured by image analysis, the majority of carbon particles in the 0.5% carbon sheet was less than 5 μm in diameter while the majority of particles in the sheet with 1% carbon was between 11 μm to 25 μm in diameter. There may have been some sieving action occurring during the production of the two different carbon containing sheets to explain the difference in carbon size[1]..

C. References:

Baliga, V., P.M. Notebook #8412, pp. 149, 153-155.

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II. SUPPORT TO OPERATIONS AND R&D (BALIGA, SANDERS, HENRY)

A. Objective: Provide analytical support to Operations and R&D.

B. Results:

Characterization of Cork-Tipped and Pearl-Tipped Cartier Cigarettes: Tipping paper and rod paper from two different Cartier cigarettes were examined for their structure and composition. One cigarette used a pearl tipping paper and the other used a cork tipping paper. The outer surface of the pearl tipping paper contained mica and Ti-containing particles and a few glass-like fibers. The inside surface of the tipping paper was made of softwood fibers with no observable additives. The tipping paper contained dilution holes scattered randomly within a 6mm wide area around the filter. The total area of dilution holes was 0.73 mm^2 with a mean hole area of 0.0014 mm^2.

The outer surface of the cork tipping paper was coated with a layer of rectangular rods 0.3 μm by 0.8 μm. Beam damage caused the particles to melt and fuse together, which suggested that they

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PROJECT NUMBER: 1902
PROJECT TITLE: Tobacco Microbiology
PROJECT LEADER: D. J. Ayers
WRITTEN BY: D. K. Chadick
PERIOD COVERED: September, 1988

I. ART FILLER STORAGE STUDY

A. Objective: To determine the effects of storage on the microbial load of ART filler material at 35°C and 25°C with 80% RH.

B. Status: To date, four of the five experiments have been initiated in this study.

C. Results: Bacterial counts showed only a slight decrease or no change over initial counts for the data accumulated from experiments 1-4 after 4,2,2, and 1 week(s) of storage, respectively. Mold and yeast counts were variable and exceeded acceptable laboratory limits ($\leq$ 80 mold and/or yeast colonies per gram, see Reference 1) in all four experiments to date (2).

D. Plans: Complete study.

E. References:

1. Crockett, E. A. The Microbial Quality Improvement Program (MQIP) As Conducted in the OC Semi-Works Primary Facility. Special Report #87-115; 1987 December 21.

2. Jones, J. Notebook No. 8590, pp. 73, 75, 77-80.

II. BACTOMETER SCATTER EXPERIMENTS

A. Objective: To determine the normal scatter in detection times of mixed and pure bacterial cultures (1).

B. Results: In an effort to determine if possible differences in cellular growth phase between previously conducted experiments might be responsible for an observed variation (2), the protocol was revised to utilize cells in the log phase of growth. The results of duplicate experiments continued to demonstrate high variation between experiments when using either a pure culture of Bacillus subtilis and B. pumilus or a mixed culture of B. subtilis, B. pumilus and B. circulans. However, the variation was reduced significantly between duplicate experiments using log phase B. circulans as a pure culture (3).

C. Plans: Investigate effect of spores on detection times.

D. References:

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PROJECT NUMBER: 1904
PROJECT TITLE: Tobacco Physiology and Biochemistry
PROJECT LEADER: H. Y. Nakatani
WRITTEN BY: H. Y. Nakatani and E. D. Mooz
PERIOD COVERED: September, 1988

I. LOW NICOTINE STUDY

A. Objective: To investigate the biochemistry of the nicotine biosynthetic pathway at putrescine N-methyltransferase (PMT) and specifically to isolate PMT from tobacco root extracts.

B. Status: Root extracts were processed to the 40-65% ammonium sulfate stage (PM extracts 82, 83) and harvest of group 14 plants was completed. Roots from plants were also harvested and stored for a topping study (1).

A number of affinity support media were tested for possible use in purification of PMT; these included ω-aminohexyl Sepharose 4B, epoxy-linked SAH-Sepharose 6B, NMP-hexanoic acid-Sepharose 4B, hexanoic acid Sepharose 4B, ω-aminobutyl-C_3-Agarose, ω-aminoethyl-C_3-Agarose and ω-aminopropyl-C_3-Agarose (the SAH and NMP-linked material were prepared by Dr. W. P. Hempfling) (3,5,6). PMT was bound to the NMP-CH-Sepharose 4B column, but addition of putrescine did not release the PMT. However, 40-50% of the PMT applied was eluted with the protein peak using a 0 to 1 M NaCl or 0 to 0.75 M NaCl gradient. The ω-aminoethyl Agarose support medium appears to be the most useful linker material; 80% of the PMT-activity subjected to the column was eluted with a 50 mM NaCl step gradient and the peak fraction showed an increased specific activity greater than 3-fold over the starting fraction (5,6). Further SAH affinity matrices were examined (Bethesda Research Laboratories and an ω-aminohexyl Sepharose 4B, prepared by Dr. W. P. Hempfling) (2). PMT-active fractions were eluted with a gradient of 0 - 1.5 M NaCl; examinations of protein bands by SDS-PAGE are being conducted.

A hydroxyapatite column was equilibrated at pH 6.8 with 1 mM potassium phosphate buffer. PMT was bound to this matrix and eluted with a 1 to 300 mM phosphate gradient. Approximately 35% of the applied activity was recovered in three fractions with an increased specific activity of 2.4-fold in the peak fraction. A higher pH value was examined to attempt increased recovery. The hydroxy-apatite column was examined at pH 7.2. With this latter column, a more shallow gradient (1 to 200 mM phosphate gradient), was used to elute PMT. About 30% of the PMT activity was recovered with a specific activity increase of 2.7-fold of the peak fraction from the starting material (4).

PMT-active samples (previous examination was done on gel slices) were obtained in solution form from a native gel, using the Canalco (ELFE) system. SDS-PAGE examination of the PMT-active fractions showed 2-3 bands in the 50-60 kDa region by silver staining (3).

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proteins was observed with both APET and an antibody to a protein not found in plants. Also, densitometry of Coomassie stained gels of PMT Prep I fractions indicated an inverse correlation between the levels of protein in the PMT-containing region and the specific activity of the fraction. This indicated the possibility that this area still contains several contaminating proteins.

C. Plans: The nitrocellulose blotting procedure will be optimized to provide a more quantitative transfer of protein. The use of APET staining of PMT preparations will be discontinued until purer preparations of PMT become available. The number of proteins in the PMT containing region will be estimated using two dimensional gel electrophoresis.

D. Reference: Nixon, G.M. Notebook No. 8711, p. 1.

IV. GLUTATHIONE DEPLETION ASSAY (GDA)

A. Objective: To determine the effect of the reduction in GSH level by 2R1 CSC and diethyl maleate (DEM) on Salmonella TA98 activity of a direct acting control compound, 2NF.

B. Results: GSH in TA98 was depleted by both DEM and 2R1 CSC (27 and 51% respectively) and by each in the presence of 2NF (81% for 2R1 CSC + 2NF and 63% for DEM + 2NF). However, there was no increase in the TA98 2NF activity due to GSH depletion by either DEM or 2R1 CSC.

C. Plans: Plans are to repeat these experiments using [1-chloro-2,4-dinitrobenzene (CDNB)] as the direct acting compound.

D. Reference: McCoy, W. R. Notebook No. 8555, pp. 165-169.

V. SALMONELLA/MICROSOME (S/M ASSAY) -- CALCIUM EFFECTS ON SAMPLES FROM THE CROSSED SOLUBLE/BASE WEB STUDY

A. Objective: Various amounts of calcium acetate (to achieve a 3-7% range of total calcium) were added to either bright baseweb (BrBW) or burley CEL (BuCEL) oversprayed onto BrBW to determine: a) the effects on IT CSC delivery and/or burn rate and, b) if there was a concentration response towards activity in the S/M assay. An additional objective was to determine if the S/M IT CSC specific activity (S.A.) of the BuCEL + BrBW control could be altered by varying the amount of BuCEL added to the BW.

B. Results: Several conclusions were drawn from the data: 1) as percent Ca++ increased, CSC yields correspondingly decreased for both BrBW alone and BuCEL + BrBW; 2) there was no change in puff count when Ca++ was added to the BrBW; 3) when Ca++ was added to BuCEL and oversprayed onto the BW, the cigarettes with the highest amount of added Ca++ (7%) were difficult to smoke (20-22 puffs vs 10 puffs for the control); 4) Ca++ added to the BW alone did not produce a significant increase in S/M IT CSC S.A. as compared to

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B. Results: Slow heating experiments designed to investigate the role of antioxidants in decomposition of TSNA were completed. NNN and mixtures of NNN with excess ascorbyl palmitate (AP) and propyl dihydroxydihydrocinnamate (propyl DHHC) were placed in a GC oven in a device which was connected to a thermal energy analyzer (TEA) via a pyrolysis oven. The GC oven was heated at 5°C/min. to 400°C with the pyrolysis oven off, and the temperature of NO evolution measured. Either antioxidant caused a decrease in evolution temperature from ~210°C to ~125°C, with no other peaks appearing, indicating that both compounds enhance decomposition of NNN. With the pyrolysis oven on, NO evolution due to distillation during heating can also be observed. Under these conditions, preliminary results suggest that there are differences in the effects caused by the two antioxidants.

C. Plans: After identification of an OrCEL fraction with TSNA-reducing activity, further decomposition studies will be performed.

D. References:

Tickle, M. Notebook 8716, pp. 20-21.
Morgan, W. R. Notebook 8579, pp. 67-68.

III. CROSSED SOLUBLES/BASE WEB STUDY (CHEMISTRY)

A. Objective: To investigate the smoke chemistry of model cigarettes made from all possible combinations of solubles from bright, burley and oriental tobaccos on base webs from the three tobaccos.

B. Results: Several separation methods were applied to BuCEL in order to obtain data on the relationship of Salmonella/microsome (S/M) activity to precursors present in specific fractions. The insolubles fraction was obtained simply by centrifuging BuCEL and suspending the insolubles in water for application to BrBW. The soluble fraction (BuSl) was subjected to ultrafiltration (1000MW cutoff) at 5 different concentrations, and the fractions either passing through or retained were stored for future application to BrBW. BuSl fractions obtained by butanol-water liquid-liquid extraction were prepared for application to BrBW as well as later fractionation by reversed phase HPLC.

An experiment in which $Ca(OAc)_2$ was added to BuCEL/BrBW has been completed and preliminary conclusions have been drawn. Addition of Ca^{++} to BrBW alone or BuCEL/BrBW does not affect puff count if the total Ca^{++} is not higher than ~7 and 5.5%, respectively. TPM delivery of BrBw or BuCEL/BrBW is decreased almost linearly by adding $Ca(OAc)_2$.

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C. Plans: Apply fractions prepared to BrBW, prepare cigarettes, and smoke for S/M assay. R. Izac will apply C-18 HPLC for separation of the butanol-water fractions. Filler will be prepared containing varying ratios of BuCEL and $Ca(OAc)_2$ on BrBW for determination of smoking characteristics and activity data.

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PROJECT NUMBER: 1758
PROJECT TITLE: Tobacco Cell Wall Research
PROJECT LEADER: G. H. Bokelman
PERIOD COVERED: September, 1988

I. SIDESTREAM REDUCTION (B. Rogers, S. Baldwin, G. Bokelman and S. Tafur)

A. Objectives: (1) Prepare cigarette paper, acceptable both in appearance and porosity, on the pilot-scale paper machine at the University of Maine and (2) continue to prepare handmade cigarettes from cigarette paper handsheets.

B. Results: A quantity of cigarette paper was prepared which was judged to be acceptable in appearance and formation (1). However, we were not able to achieve the desired range of porosity in this cigarette paper, although we did approach it. Further investigations strongly suggested that the flax used for the starting material was too highly purified, having too small a quantity of material referred to as "shives" (2). Depending on processing conditions, the content of these crude fibers can be reduced during the decortication, cooking, and purification of the raw flax. Individual cells, which are usually referred to as fibers, of "shive" contribute to the filling of the sheet and to binding. Consequently, paper prepared without these fibers does not form a tight enough sheet, and is thus too porous. However, it was found that varying refining conditions to produce a mixture of fiber lengths for the residual bast fibers partially compensated for the lack of "shive" cells.

Our best cigarette paper run utilized a fine particle size calcium carbonate (Multiflex MM), a high paper basis weight and the optimum refined fiber mixture determined in earlier runs. Using these conditions, paper with an 11 Coresta porosity was produced.

Numerous handmade cigarettes were prepared from cigarette paper handsheets. A total of nineteen cigarette samples were submitted for single port light extinction measurements. These included cigarettes made from papers with varying particle sizes of $CaCO_3$, different levels of chemical additives (potassium succinate and MAP), bilayer sheets incorporating carbon in the inner layer (both with and without methylcellulose) and $MgCO_3$. In addition, handmade cigarettes were made from a commercial paper. A preliminary evaluation of the resultant data indicated that $MgCO_3$ and high surface area $CaCO_3$ fillers give greater sidestream visibility reductions than would be predicted based on porosity alone.

C. Plans:

1. We will attempt to locate sources of less purified flax, that is, flax containing a greater content of "shive" cells.

2. We will send conventional cigarette paper to Dr. David Kraske at the University of Maine to regenerate the fibers and determine freeness and weight length of the fibers as an indication of refining conditions used.

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